# THE INSTITUTE OF CHARTERED ACCOUNTANTS OF NIGERIA

# INSIGHT

## ATSWA SEPTEMBER 2026 EXAMINATIONS

## PART II

### Question Papers, Suggested Solutions and Examiners' comments

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# THE ASSOCIATION OF ACCOUNTANCY BODIES IN WEST AFRICA

## ACCOUNTING TECHNICIANS SCHEME, WEST AFRICA
## SEPTEMBER 2026 EXAMINATIONS (PART II)

## FINANCIAL ACCOUNTING

**PLEASE READ THESE INSTRUCTIONS BEFORE COMMENCEMENT OF THE PAPER**

# EXAMINATION INSTRUCTIONS

1. All solutions should be in **blue** or **black** ink. Any solution in pencil will not be marked.
2. Read all instructions on each part of the paper carefully before answering the questions.
3. Ensure that you do not answer more than the number of questions required for **Section B (The Essay Section).**
4. Check your pockets, purse and mathematical sets, etc, to ensure that you do not have prohibited items such as telephone handset, electronic storage device, wrist watches, programmable devices or any form of written material on or around you in the examination hall. You will be stopped from continuing with the examination and liable to further disciplinary actions including cancellation of examination result if caught.
5. Do not enter the hall with anything written on your docket.
6. Insert your examination number in the space provided above.

**TUESDAY, SEPTEMBER 22, 2026**

**DO NOT TURN OVER UNTIL YOU ARE TOLD TO DO SO**

# THE ASSOCIATION OF ACCOUNTANCY BODIES IN WEST AFRICA
# ACCOUNTING TECHNICIANS SCHEME, WEST AFRICA
# PART II EXAMINATIONS – SEPTEMBER 2026

## FINANCIAL ACCOUNTING

**Time Allowed: 3 hours**

**SECTION A: PART I MULTIPLE CHOICE QUESTIONS (30 MARKS)**

**ATTEMPT ALL QUESTIONS IN THIS SECTION**

**Write ONLY the alphabet (A, B, C, D or E) that corresponds to the correct option in each of the following questions/statements.**

**Use the following information to answer questions 1 and 2:**

Alpha-gold Ltd has a trade receivable balance of ₦4,500,000 at year end. It is the company's policy to maintain a general allowance of 10% on its receivables. The general allowance brought forward from the previous year was ₦104,000.

1. What is the amount of general allowance of bad debt that will be charged into the statement of profit or loss of Alpha-gold Ltd in the current year?

   A. ₦10,400
   B. ₦104,000
   C. ₦346,000
   D. ₦450,000
   E. ₦554,000

2. What is the net trade receivable that should be disclosed in Alpha-gold Ltd statement of financial position at the end of the year?

   A. ₦4,050,000
   B. ₦4,154,000
   C. ₦4,258,000
   D. ₦4,396,000
   E. ₦4,500,000

3. The residual interest in an entity after the value of all its liabilities has been deducted from the value of all its assets is referred to as .....

   A. reserve
   B. share acquisition
   C. working capital
   D. retained earnings
   E. equity

4. Revenue expenditure paid that covered more than the reporting period should be classified as .....

A. non-current asset
B. current assets
C. residual assets
D. intangible assets
E. financial assets

5. Which of the following is **NOT** considered as part of the Generally Accepted Accounting Principles (GAAP) required for the preparation and presentation of financial statements?

A. Conventions
B. Company law
C. Accounting concepts
D. Business transactions
E. Rules and regulations

6. Which of the following best illustrates a conflict of interest in the accounting field?

A. An accountant performing routine financial reporting with no personal stake.
B. An accountant ensuring proper documentation for compliance.
C. An accountant following mandatory procedure without bias.
D. An accountant auditing a company where they hold a significant investment.
E. An accountant preparing accounts without complying with relevant accounting standards.

7. Suppose your co-worker discussed a secret matter of a client with you. Which company's rule and guideline preclude you from discussing such information with a third party?

A. Objectivity
B. Duty of professional care
C. Confidentiality
D. Professional behaviour
E. Integrity

8. Which of the following is the cornerstone of ethical behaviour by a professional?

A. Well trained employees
B. Infrastructure
C. Advocacy
D. Integrity
E. Negative attitude

9. The type of ethical threat that might occur when a professional accountant promotes the point of view of a client is

A. Self-interest threat
B. Self-review threat
C. Familiarity threat
D. Intimidation threat
E. Advocacy threat

10. Ezeego Bolekaja, an AATWA graduate informed his employer that he is not feeling fine, hence, he will be unable to come to work. However, Ezeego Bolekaja is well but wants to attend to personal issues.

Which of the following qualities of ethical behaviour has he violated?

A. Objectivity
B. Duty of professional care
C. Integrity
D. Professional behaviour
E. Confidentiality

11. When a partner withdraws regularly from the firm, such withdrawals are debited to which account?

A. Capital account
B. Profit or loss account
C. Current account
D. Reserve account
E. Appropriation account

12. Which of the following is **NOT** a limitation of the single entry system?

A. It is incomplete and unscientific
B. It is useful for tax computation
C. True financial position cannot be ascertained
D. It does not follow double entry principles
E. Auditing is not possible

13. Where will prepaid expenses appear in the statement of financial position?

A. Current liabilities
B. Non-current liabilities
C. Current assets
D. Non-current assets
E. Revenue

14. A and B are partners sharing profits in the ratio 3:2. They admit C as a new partner for a 1/5 share. The firm's goodwill is valued at Le50 million. C brings only Le5 million in cash as goodwill contribution.

    What is the total amount of goodwill that should be adjusted through A and B's capital accounts?

    A. Le5 million
    B. Le10 million
    C. Le15 million
    D. Le45 million
    E. Le50 million

15. Which of the following best defines the "cut-off point" in inventory valuation?

    A. The physical count of inventory
    B. The end of the financial reporting period
    C. The time at which sales are recorded
    D. The period in which all liabilities are settled
    E. The moment when stock reaches reorder level

16. Under IFRS, which user group is interested in a company's profitability and future dividends?

    A. Suppliers
    B. Customers
    C. Investors
    D. Regulators
    E. Competitors

17. A company purchased a truck for GH¢8,000,000. Estimated residual value is GH¢800,000. Useful life: 4 years. What is the depreciation for Year 1 using the Reducing Balance Method at 30%?

    A. GH¢2,160,000
    B. GH¢2,400,000
    C. GH¢2,800,000
    D. GH¢3,000,000
    E. GH¢3,200,000

18. Which of the following is **NOT** a basis of comparison in financial statement analysis?

    A. Intra-firm comparison
    B. Inter-firm comparison
    C. Industry-average comparison
    D. Time-series comparison
    E. Geographic comparison

19. Which of the following is **NOT** considered part of the cost of inventory?

A. Purchase price
B. Import duties
C. Storage cost of finished goods
D. Transportation inwards
E. Trade discounts

20. Which of the following is a key fraud risk associated with remote work environments?

A. Improved internal controls
B. Increased transparency in financial reporting
C. Reduced need for supervision
D. Limited visibility over employee activities
E. Frequent in-person audits

21. The accounting basis used in preparing the statement of financial position when the going concern of a business entity is doubtful or questionable is .....

A. Doubtful basis
B. Questionable basis
C. Going concern basis
D. Break-up basis
E. Matching basis

22. The extra quantitative and non-quantitative information that must be provided to users of financial statement for better understanding of financial position and performance of a reporting entity is .....

A. measurement requirements
B. extra information requirements
C. disclosure requirements
D. presentation requirements
E. recognition requirements

23. The combination of regulations, rules, concepts and conventions in the presentation of meaningful financial statements is called GAAP which means:

A. Generally accepted accounting process
B. Generally accepted accounting procedures
C. Generally accepted accounting practices
D. Generally accepted accounting principles
E. Generally accepted accounting performance

24. In accordance with the conceptual framework for financial reporting, an asset is .....

A. an economic resource controlled by the entity because of past events from which future economic benefits is expected to flow to the entity

B. the entity's right to receive income or reduce expenses in future

C. an economic resource outsourced by the entity from which future economic benefits are expected to flow to the entity

D. the future economic benefits that are expected to flow to an entity from a physical object

E. a present economic resource which brings in patronage with the capacity to earn profits in future

25. The speculative investor as a user of financial statement is interested in potential growth, hence pays particular attention to:

(i) Trends of sales/profit
(ii) Forecast of expansion based on comments by financial experts
(iii) Possible yield on investments
(iv) Redundancies and layoffs
(v) Prospects of continuous supply

A. i, iv and v
B. iii, iv and v
C. i, ii and iii
D. i, iii and v
E. ii, iii and v

**Use the following information to answer questions 26 and 27**

On January 15, 2025, Adobe Enterprises agreed to supply Pashur Ventures with a machine for the price of ₦800,000.

On February 28, 2025, Adobe purchased the machine from a wholesaler for ₦640,000 on account. Adobe delivered the machine to Pashur on March 22, 2025, on account.

On April 17, 2025, Pashur paid Adobe ₦ 800,000. On May 12, 2025, Adobe paid the wholesaler the sum of ₦640,000.

26. Using the Cash Basis of accounting, Adobe Enterprises income and expenses will be recognised in .....

A. March and May
B. February and April
C. April and May
D. January and February
E. March and April

27. Using the Accrual Basis of accounting, Adobe Enterprises expenses and income will be recognised in .....

A. January and February
B. February and April
C. February and March
D. March and April
E. January and February

28. The accounting convention that guides the preparers of financial statements when faced with choosing between two competing figures in reporting a given item is

A. materiality
B. consistency
C. conservatism
D. substance over form
E. recognition

29. In recording the value of a newly acquired non-current asset in books of an entity, which of the underlisted values should be considered?

A. Set off value
B. Conservative value
C. Estimated value
D. Verifiable objective value
E. Subjective and opinionated value

30. The setback associated with the Cash Basis of accounting does **NOT** include

A. Non-current assets utilisation in the form of depreciation is ignored
B. Disallowed tracking actual sales and purchases
C. Matching cost with income in order not to distort profits
D. Un-earned income and the liabilities are not reported
E. Non-disclosure of income that has not been invoiced or received

## SECTION A: PART II SHORT ANSWER QUESTIONS (20 MARKS)

### ATTEMPT ALL QUESTIONS

**Write the correct answer that best completes each of the following questions/statements.**

1. A trial balance is extracted from the general ledger. The various basic year-end adjustments that are made to the accounts include ..... and .....

2. The difference in opening equity and closing equity of an entity over a financial year can be due to ..... and .....

3. Two components of statement of changes in equity are ..... and .....

4. 300 units of inventory Y costs ₦3 per unit and has a net realisable value of ₦4 per unit. Also 600 units of inventory Z costs ₦6 per unit and has a net realisable value of ₦5 per unit. The closing inventory of Y and Z in the statement of financial position are ..... and ..... respectively.

5. Giving or receiving something of value with the intention of influencing the recipient is known as .....

**Use the following information to answer questions 6 and 7**

Adewale & Co. chartered accountants prepared financial statements for a new client Kabiotire Ltd. The draft account shows a poor result for the year. The client requested unjustified adjustments of the account to show better result, otherwise they will take their account elsewhere.

6. Threatening to take their business elsewhere is ..... type of threat.

7. The accounting firm's fundamental principle that is most under threat is .....

8. A person who breaks into a computer system to get illegal access to the information stored there is known as .....

9. The two types of financial information useful to employees are ..... and .....

10. Creditors use financial statements to evaluate the creditworthiness of an entity, focusing on .....

11. The element of financial statements that is capable of directly increasing the equity during the reporting period is .....

12. When a change in accounting policy is applied retrospectively, the financial statements that need to be restated are the current and prior period income statements and .....

13. Two (2) methods of valuing closing inventory in accordance with the provisions of IAS 2 are ..... and .....

14. In accounting, the cost flow assumption that matches the most recent costs with current revenues is known as .....

15. In accounting for a rights issue, the proceeds received are credited to share capital and any excess over the par value is credited to the ..... account.

16. The cut-off point in inventory valuation is critical because it determines whether goods in transit are included in inventory at the end of the .....

17. The act of systematic recording of all monetary transactions in permanent form so that the financial position and performance of an entity can be properly documented is called .....

18. The concept that assumes that an established entity will operate in perpetuity is called.....

19. The part of the component of financial statements that deals with fundamental accounting concept is referred to as.....

20. The art or practice of arranging and presenting accounting information in the final accounts to give good effect to make the documents attractive to users without reflecting what was true about the organisation is .....

**SECTION B: ATTEMPT ANY FOUR QUESTIONS (50 MARKS)**

**QUESTION 1**

The balance on the receivable ledger control account in the general ledger of Sapon Nigeria Ltd. is ₦53,690,000 as at December 31, 2024.

The accounting officer of the company extracted the balances on the individual customer's accounts in the receivable ledger as stated below:

| | **₦'000** |
|---|---|
| Adewale | 12,000 |
| Bala | 8,000 |
| Clara | 6,000 |
| Danjuma | 11,000 |
| Ejike | 15,000 |
| **Total** | **52,000** |

The Chief Accountant of Sapon Nigeria Ltd has requested that an investigation be carried out to determine the causes of the differences between the control account and the individual customer's schedule balance.

The following were discovered:

i. A sale on credit of ₦1,700,000 to Adewale has not been recorded in the customer's account in the receivable ledger but was included in the control account balance.

ii. Bala has supplied goods to Sapon Nigeria Ltd to the value of ₦400,000 and these have not yet been paid for by Sapon Nigeria Ltd. It has been agreed that the amount should be offset against money owed to Sapon Nigeria Ltd by Bala. No entries have yet been made for this contra adjustment in the general ledger or the receivable and payable ledgers.

iii. Sales returns of ₦550,000 by Clara have been recorded in Clara's individual account in the receivable ledger, but the transaction was not posted to the general ledger.

iv. Danjuma took advantage of an early settlement discount, saving ₦240,000. Sapon Nigeria Ltd had not expected Danjuma to take the discount. This has been recorded in Danjuma's individual ledger, but the transaction was not posted to the general ledger.

v. Sales/returns of ₦800,000 by Ejike have not been recorded in the customer's account in the receivable ledger but are included in the account balance.

**Required:**

(a) Prepare a reconciliation statement of the receivable control account and the individual customer's receivable ledger. (8½ Marks)

(b) Prepare a revised schedule of the individual customer's receivable balances after effecting the corrections. (4 Marks)

**(Total 12½ Marks)**

## QUESTION 2

A financial accounting ratio states the magnitude of two selected numerical values taken from an enterprise's financial statement.

The following were extracted from the books of Jayous Nigeria Limited for the year ended December 31, 2024.

| | Le'000 | | Le'000 |
|---|---|---|---|
| Sales | 75,000 | 8% Loan note | 4,000 |
| Current liabilities | 13,890 | Ordinary shares | 20,000 |
| Trade receivables | 11,000 | 7% Preference share | 10,000 |
| Closing Inventory | 5,000 | General Reserve | 5,810 |
| Prepayments | 100 | Non-current assets | 35,330 |
| Bank balance | 370 | Goodwill | 190 |
| Cost of goods sold | 53,000 | | |
| Administrative overhead | 12,700 | | |

**Additional information:**

(i) Company income tax rate was 30% of the net profit for the year.
(ii) Administrative overhead include interest on loan notes.

**Required:**

Using the financial information presented above, calculate the underlisted financial accounting ratios:

(a) Fixed interest cover (2½ Marks)
(b) Fixed dividend cover (2½ Marks)
(c) Proprietary ratio (2½ Marks)
(d) Rate of return on total assets (2½ Marks)
(e) Acid test ratio (2½ Marks)

**Show all workings and provide answers to two decimal places.**

**(Total 12½ Marks)**

**QUESTION 3**

(a) Bookkeepers and accountants perform different roles within the realm of financial management of a reporting entity. They have distinct sets of responsibilities.
   (i) State and explain **FOUR** responsibilities of a bookkeeper. (4 Marks)
   (ii) State and explain **FOUR** responsibilities of an accountant. (4 Marks)

(b) Write short notes on the following types of accounting
   (i) Performance management or management accounting. (1½ Mark)
   (ii) Cost accounting. (1 Mark)
   (iii) Forensic accounting. (1 Mark)
   (iv) Environmental accounting. (1 Mark)

**(Total 12½ Marks)**

## QUESTION 4

(a) Discuss four guiding ethics for professional accountants. (6 Marks)

(b) Highlight four factors that an organisation might consider when sourcing for accounting software. (6½ Marks)

**(Total 12½marks)**

## QUESTION 5

(a) Explain how IFRS enhances comparability and transparency for users of financial statements. (4 Marks)

(b) What ratios are key in analysing capital structure? (5 Marks)

(c) A company issues bonds at a discount:

| | |
|---|---|
| Face value: | GH¢100,000 |
| Issue price: | GH¢92,000 |
| Coupon rate: | 6% (paid annually) |
| Effective interest rate: | 8% |
| Term: | 3 years |

**Required:**

Calculate the Interest expense and carrying amount at the end of Year 1. (3½ Marks)

**(Total 12½ Marks)**

## QUESTION 6

The IASB Conceptual Framework for financial reporting gives guidance on the criteria that an element must meet before they are recognised or derecognised in the financial statements.

**Required:**

(a) Define accounting elements and state their categorisation in the related financial statements. (2 Marks)

(b) Define recognition and de-recognition of accounting elements. (3 Marks)

(c) State **FOUR** criteria that the elements of financial accounting must meet before they are recognised in the financial statements. (6 Marks)

(d) If an item did not meet the definition of an element and hence not recognised, what accounting treatment should be given to such an item in financial statements? (1½ Marks)

**(Total 12½Marks)**

## FINANCIAL ACCOUNTING SOLUTIONS

## SECTION A: PART 1

1) C

2) A

3) E

4) B

5) D

6) D

7) C

8) D

9) E

10) C

11) C

12) B

13) C

14) A

15) B

16) C

17) B

18) E

19) C

20) D

21) D

22) C

23) D

24) A

25) C

26) C

27) C

28) C

29) D

30) C

TUTORIAL

Q1. ₦4,500,000 x 10% = ₦450,000 – ₦104,000 = ₦346,000

Q2. ₦4,500,000 – ₦450,000 = ₦4,050,000

Q14. ₦50,000,000 - ₦5,000,000 = ₦45,000,000

Q17. ₦8,000,000 x 30% = ₦2,400,000

## EXAMINER'S COMMENT

The questions covered the entire syllabus and being a compulsory question, all the candidates attempted the questions. Performance was very good as about 80% scored above the average mark allocated.

## SECTION A: PART II SHORT ANSWER QUESTIONS

1) Depreciation expense, Accruals and prepayments bad and doubtful debts and inventory

2)
- Capital introduced
- Profit or loss
- Drawings
- Dividend paid

3)
- Share capital
- Retained earnings
- Revaluation reserve
- Share premium

4) Y is (300 x 3) = ₦900

Z is (600 x 5) = ₦3,000

5) Bribe or Corruption

6) Intimidation threat

7) Integrity

8) Hacker

9) Profitability, Financial stability and Budget of the company

10) Liquidity, solvency, and cash flow adequacy

11) Income, Gain, Profit, assets

12) statement of financial position

13) FIFO, weighted average and specific identification method

14) LIFO

15) Share Premium

16) Period. or Reporting period

17) Book-keeping

18) Going concern

19) Statement of significant accounting policies

20) Window dressing or creative accounting

## EXAMINER'S COMMENT

The questions were spread across the whole syllabus and being compulsory question, all the candidates attempted the questions. Candidates' performance was very good. More than 60% of the candidates scored above average mark.

**SECTION B:**

**Solution 1**

a) **Reconciliation statement of receivable control account and individual customers receivable ledger**

**SAPON NIGERIA LIMITED**
**Receivable control account**

| | ₦'000 | | ₦'000 |
|---|---|---|---|
| **Bal.** | **53,690** | Contra entry (ii) | **400** |
| | | Sale returns (iii) | 550 |
| | | **Discount allowed (iv)** | **240** |
| | | **Bal. c/d** | **52,500** |
| **Total** | **53,690** | **Total** | **53,690** |
| **Bal c/d** | **52,500** | | |

**Individual customers receivable ledger**

| | ₦'000 |
|---|---|
| Total bal in individual receivable ledger | 52,000 |
| Sales – Adewale | 1,700 |
| Contra entry in respect of Bala | (400) |
| Sales returns in respect of Ejike | (800) |
| Total | **52,500** |

b) **SAPON NIGERIA LIMITED**
**INDIVIDUAL LEDGER RECONCILIATION AS AT DECEMBER 31, 2024**

| | Original balances | Adjustment | Adjusted balances |
|---|---|---|---|
| | ₦'000 | ₦'000 | ₦'000 |
| **Adewale** | **12,000** | **1,700** | **13,700** |
| **Bala** | **8,000** | **(400)** | **7,600** |
| **Clara** | **6,000** | **-** | **6,000** |
| **Danjuma** | **11,000** | **-** | **11,000** |
| **Ejike** | **15,000** | **(800)** | **14,200** |
| **Total** | **52,000** | **500** | **52,500** |

**EXAMINER'S COMMENT**

The question tested candidates' knowledge on receivable control account, while some of the candidates got the A Part, which is receivable control account, but they failed in the B Part, which is the individual ledger reconciliation.

About 30% of the candidates attempted the question, and performance was poor.

## SOLUTION 2

(a) **Fixed interest cover** (PBIT ÷ Loan Interest): (₦ 9,620,000 ÷ ₦320,000) = 30.06 times

(b) **Fixed dividends cover** (Profit after tax ÷ Preference dividend): ₦6,510,000 ÷ 700,000 = 9.3 times

(c) **Proprietary ratio** (Shareholders' fund ÷ Total assets - Goodwill): ₦35,810,000 ÷ ₦51,800,000 = 0.69: 1

(d) **Rate of return on total assets** (PBIT ÷ Total assets including goodwill): (₦9,620,000 ÷ ₦51,990,000 x 100 = 18.5%

(e) **Acid test ratio** (Quick assets ÷ Current liabilities): ₦11,370,000 ÷ ₦13,890,000: 1 = 0.82.1

## EXAMINER'S COMMENT

This question tested candidates' understanding of accounting ratios. Five ratios were specifically asked to be computed. Many of them did not attempt the question and the few that attempted performed poorly.

## SOLUTION 3

(a) Responsibilities of a book-keeper

i. **Recording Financial Transactions:** Maintaining accurate records of all day-to-day financial transactions, including sales, purchases, receipts and payments.

ii. **Maintaining Accounting Records:** Keeping the general ledger and subsidiary ledgers updated to ensure all transactions are properly classified.

iii. **Managing Accounts Receivable:** Raising invoices, recording customer payments and monitoring outstanding balances to support timely collections.

iv. **Managing Accounts Payable:** Processing supplier invoices and ensuring payments are made accurately and on schedule.

v. **Performing Bank Reconciliations:** Reconciling accounting records with bank statements and investigating any discrepancies identified.

vi. **Processing Payroll Records:** Recording employee salaries, deductions and statutory contributions in the accounting system.

vii. **Maintaining Supporting Documentation:** Organising and retaining invoices, receipts, contracts and other source documents for future reference and audit purposes.

viii. **Monitoring Cash and Petty Cash:** Tracking cash receipts, cash disbursements and petty cash balances to ensure proper accountability.

ix. **Preparing Basic Financial Reports:** Producing trial balances, account schedules and other reports required for management review.

x. **Ensuring Accuracy of Financial Data:** Reviewing records periodically to identify and correct errors, omissions or duplicate entries.

**Responsibilities of an accountant:**

i. Preparing Financial Statements: Producing Income Statements, Balance Sheets, Cash Flow Statements and related disclosures in accordance with applicable standards.

ii. Financial Reporting: Ensuring periodic financial reports are accurate, complete and compliant with IFRS, GAAP or other relevant frameworks.

iii. Applying Accounting Standards: Determining the appropriate accounting treatment for transactions and ensuring consistency in policy application.

iv. Conducting Financial Analysis: Assessing profitability, liquidity, solvency and operational performance to support management decision-making.

v. Budgeting and Forecasting: Preparing budgets, forecasts and financial projections to support strategic planning and resource allocation.

vi. Managing Tax Compliance: Calculating tax liabilities, preparing tax filings and ensuring compliance with applicable tax regulations.

vii. Overseeing Period-End Close: Managing month-end and year-end closing activities, including journal entries, accruals and reconciliations.

viii. Strengthening Internal Controls: Designing and monitoring financial control processes to reduce risk and safeguard organisational assets.

ix. Supporting Audits: Liaising with internal and external auditors, preparing supporting schedules and resolving audit queries.

xi. Providing Strategic Financial Advice: Advising management on financial performance, business risks, investment decisions and opportunities for

(b) i. Performance management or management accounting: provide financial information for managers and executives within an economics entity to aid in decision making as strategic planning it will uses budgeting forecasting and performance measurements techniques to help organizations achieve determined goals.

ii. Cost accounting: aids pricing by accumulating an analyzing cost (labour, materials and overhead) associated with producing goods and services to determine the profitability of the products/ services.

iii. Forensic accounting: involves using accounting skills to investigate financial crimes such as embezzlement, fraud, and money laundering. It uses data analysis and financial modeling to gather evidence.

iv. Environmental accounting: it involves measuring and reporting the environmental impacts of an organization's activities, such as greenhouse gas emissions, water pollution and waste generation. It helps organisations understand their environment and areas for improvement and make informed decisions about environmental strategies.

## EXAMINER'S COMMENT

The question was like a bonus to serious candidates. The A Part of the question was on responsibilities of a bookkeeper and that of an accountant, while the B Part, was on types of accounting.

Performance was very good as over 80% of the candidates that attempted the question scored above average mark.

## SOLUTION 4

(a) i. **Professional competence and due care**: Professional accountants

maintain necessary level of professional knowledge and skills to enable their clients or employers to receive competent professional services in accordance with current practical, legal and technological developments. There is an on-going obligation to do so. Professional accountants should act conscientiously and in accordance with applicable technical and professional standards when providing professional services.

ii. **Professional behavior: Professional** accountants must comply with relevant laws and regulations and avoid conduct that discredits the profession.

iii. **Integrity:** A professional accountant must be honest and truthful in all professional and business dealings.

iv. **Objectivity:** Professional accountants must not be biased, encourage conflict of interests, or engage undue influence from others when taking decisions.

v. Confidentiality: **Professional** accountants must adhere to the principle and practice of keeping sensitive information private unless the owner or custodian of the data express authorised its sharing with third parties, or when there is compulsion of the law to disclose such information.

b) **Factors that an organisation might consider when sourcing accounting software**

i. **Initial cost:** Whether the organisation can afford the upfront costs of the resources needed to build deploy and maintain the software.

ii. **Competitive advantage.** The user must consider whether the software will provide additional benefits to the organisation in terms of cost savings

iii. **User friendly software:** The software must have manuals of operations and guides to make easy navigation from module to module

iv. **Flexibility:** Whether the software can accommodate other business events, compatible with different platforms and operating systems.

v. **Adequate reporting:** whether the software can generate useful financial information that will assist in taking good decisions.

v. **Internet compatibility:** Whether the software is internet compatible to facilitate multiple users at different locations.

vi. Security, reliability and vendor support

vii. Confidentiality of data is maintained

## EXAMINER'S COMMENT

The question tested candidates' knowledge on ethics for professional accountants. The B Part was on factors to be considered when sourcing for accounting software. Candidates attempted the question, but performance was only above average.

## SOLUTION 5

a.

i. IFRS provides a consistent framework for financial reporting across jurisdictions, enhancing comparability by standardising accounting treatments. This allows users to make meaningful comparisons across companies and in time periods.

ii. IFRS also emphasises transparency through clear disclosure requirement, helping users better understand the economic reality behind the numbers.

iii. Promotes consistency in financial reporting by prescribing uniform recognition, measurement, presentation and disclosure requirements, making analysis more reliable over time.

iv. Reduces information asymmetry between management and shareholders, allowing investors, lenders, and regulators to make more informed economic decisions.

(b)

1. Debt-to-Equity = Total Debt / Total Equity
2. Equity Ratio = Equity / Total Assets
3. Interest Coverage = EBIT / Interest Expense
4. Debt Ratio = Total Liabilities / Total Assets
5. Leverage Ratio = Total Assets / Equity
6. Dividend Cover= Net Profit after tax/Dividend

(c)

Interest expense Year 1 = Carrying amount × Effective interest rate

= GHC 92,000 × 8% = GHC 7,360

Coupon paid = 6% × 100,000 = GHC 6,000

Amortisation of discount = Interest expense - Coupon paid = 7,360 - 6,000 = GHC 1,360

Carrying amount at end of Year 1 = 92,000 + 1,360 = GHC 93,360

## EXAMINER'S COMMENT

The question was of 3 parts. The A Part was how IFRS enhances comparability and transparency for users of financial statements. The B Part tested candidates' knowledge on key ratios in analysing capital structure, while the C Part was a calculation on issue of bonds at a discount.

Majority of the candidates ran away from this question. While those that attempted it did not perform well.

SOLUTION 6

(a) **Accounting elements are the fundamental components of financial statements that represent the effects of transactions and events on an entity's financial position and performance.**

| Elements | Financial statement |
|---|---|
| Income | Statement of profit or loss |
| Expenses | Statement of profit or loss |
| Assets | Statement of financial position |
| Liabilities | Statement of financial position |
| Equity | Statement of financial position |

(b) Recognition is the process of capturing an item that meets the definition of an element for inclusion in the reporting entity financial statements.

De-recognition is the process of removing an item for financial statements of a reporting entity as an asset, liability or equity when it's no longer meet the criteria for recognition.

(c) **Criteria or recognition**

- **Bear definition:** Meets the definition of one element (asset, liability, equity, income or expenses).

- **Relevance:** A reporting entity recognises an asset or a liability, if such recognition provides users of financial statements with relevant information about the assets or the ability and about income and experiences or changes equity.

- **Faithful representation:** The information must provide a faithful representation of the assets or liability or any income, expense and changes in equity.

- **Beneficial:** The information must also result in the benefits that exceed the cost of providing the information. There must not be a low probability that an inflow or outflow of economics benefits will result from an asset or a liability.

- **Measurability**: The item must be capable of being measured reliability (or measured with sufficient certainty).

(d) If an item does not meet the definition of an accounting element or fails the recognition criteria, it should not be recongised in the financial statements.

However, where the information is relevant to users, the item may be disclosed in the notes to the financial statements or through supplementary information to enhance users' understanding of the entity's financial statements.

## EXAMINER'S COMMENT

This question tested candidates' knowledge on the guidance given by IASB Conceptual Framework that all element must meet before they are recognised or derecognised in the financial statements.

Only few candidates attempted the question and performance was just above average.

**THE ASSOCIATION OF ACCOUNTANCY BODIES IN WEST AFRICA**

# ACCOUNTING TECHNICIANS SCHEME, WEST AFRICA SEPTEMBER 2026 EXAMINATIONS (PART II)

## PUBLIC SECTOR ACCOUNTING

**PLEASE READ THESE INSTRUCTIONS BEFORE COMMENCEMENT OF THE PAPER**

# EXAMINATION INSTRUCTIONS

1. All solutions should be in **blue** or **black** ink. Any solution in pencil will not be marked.
2. Read all instructions on each part of the paper carefully before answering the questions.
3. Ensure that you do not answer more than the number of questions required for **Section B (The Essay Section).**
4. Check your pockets, purse and mathematical sets, etc, to ensure that you do not have prohibited items such as telephone handset, electronic storage device, wrist watches, programmable devices or any form of written material on or around you in the examination hall. You will be stopped from continuing with the examination and liable to further disciplinary actions including cancellation of examination result if caught.
5. Do not enter the hall with anything written on your docket.
6. Insert your examination number in the space provided above.

**WEDNESDAY, SEPTEMBER 23, 2026**

**DO NOT TURN OVER UNTIL YOU ARE TOLD TO DO SO**

# THE ASSOCIATION OF ACCOUNTANCY BODIES IN WEST AFRICA
# ACCOUNTING TECHNICIANS SCHEME, WEST AFRICA
# PART II EXAMINATIONS – SEPTEMBER 2026

## PUBLIC SECTOR ACCOUNTING

**Time Allowed: 3 hours**

**SECTION A: PART I MULTIPLE CHOICE QUESTIONS (30 MARKS)**

**ATTEMPT ALL QUESTIONS IN THIS SECTION**

**Write ONLY the alphabet (A, B, C, D or E) that corresponds to the correct option in each of the following questions/statements.**

1. In line with IPSAS 45, Property, Plant and Equipment, the following terms are used **EXCEPT**

   A. Depreciable amount
   B. Carrying amount
   C. Fair value
   D. Value of architect certificate
   E. Impairment loss

2. Which of the following is **NOT** a condition that must be satisfied before an Accounting Officer may apply for virement from one sub-head to another?

   A. Virement is not to create a new sub-head or re-introduce items disallowed during the budget Process by the National Assembly

   B. The approval is by the National Assembly and conveyed by the Honourable Minister of Finance to the MDA

   C. The amount to be vired from any sub-head within a financial year under overhead cannot exceed 10% of the approved estimate for each sub-head under the overhead cost

   D. The amount vired must only be used for the purchase of Non-Current Assets

   E. A register must be kept for all virement made

3. Which of the following organs approve the national budget?

   A. The National Assembly
   B. The Executive
   C. The Minister of Finance
   D. The Accountant General of the Federation.
   E. The Auditor General for the Federation.

4. Which of the following ratios measures the average length of time it takes a corporation's Debtors to pay their debts?

   A. Inventory turnover period
   B. Payable's payment period
   C. Receivable collection period
   D. Debt to equity ratio
   E. Solvency ratio

5. Except in a transaction conducted through a financial institution, the Money Laundering (Prohibition) Act, 2011 prohibits an individual from making or accepting a cash payment exceeding .....

   A. ₦7,000,000
   B. ₦6.000,000
   C. ₦5,000,000
   D. ₦4,000,000
   E. ₦10,000,000

6. Which of the following is **NOT** a key feature of the National Chart of Accounts?

   A. Each item has a unique code
   B. Government financial statistics (GFS) 2001 compliant
   C. Non-expandable
   D. IPSAS cash and accrual basis compliant
   E. Used for both budgeting and accounting

7. Which of the following constitutional provisions stipulates that, "Pensions in respect of service in the public service of the federation shall not be taxed."?

   A. Section 173 (4) of 1999 Constitution
   B. Armed Forces Act No. 103 of 1979
   C. Pension Reform Act 2014
   D. Pension Reform Act 2004
   E. Civil Service Rules 2004

8. The following are expected from employee who retires before the age of 50 years, **EXCEPT**

   A. The employee may request for withdrawal of lump sum of money.

   B. He cannot request more than 25 per cent of the amount standing to the credit of the retirement savings account, provided that such withdrawals shall only be made after six months of such retirement and the retired employee does not secure another employment.

C. He may request for more than 25 per cent of the amount standing to the credit of the retirement savings account, provided that such withdrawals shall only be made after six months of such retirement and the retired employee does not secure another employment.

D. Withdrawals shall only be made after six months of such retirement.

E. The retired employee does not secure another employment.

9. The following are prohibited transactions for any Pension Fund Administrator **EXCEPT**

A. Hold any pension fund or asset.

B. Keep any pension fund or asset with a Pension Fund Custodian in whom the Pension Fund Administrator has any business interest, share or any relationship whatsoever.

C. Engage in any business transaction or trade in any manner with the Pension Fund Administrator as a counterpart or with the subsidiary in relation to pension fund or assets.

D. Divert or convert pension funds and assets as well as any income or brokerage, commission arising from the investment of pension fund or asset or by any other means.

E. Open retirement savings accounts for all employees with personal identity numbers (PIN) attached.

10. Which of the following is **NOT** part of the advantages of planning, programming and budgeting system (PPBS)?

A. Provides information on the objectives of the organization.
B. Lays emphasis on short-term effects.
C. Leads to rapid economic development.
D. Achieves effective use of budgeted resources and anticipated performance.
E. Lays emphasis on long-term effects.

11. The execution of building or civil engineering projects, mechanical and electrical engineering installations and any other fabrications that is normally evidenced by agreement between two or more parties is

A. construction contract
B. engineering contract
C. fabrication contract
D. installation contract
E. due process contract

12. The issue entry for inventories condemned by a Board of Survey and approved for write-off, shall be supported by a

A. condemned issue voucher
B. condemned store voucher
C. store issue voucher
D. store written off voucher
E. store recovered voucher

13. The Unit established to provide a comprehensive verification of all stocks and purchases of the ministry/extra ministerial office and other arms of government is

A. stock office
B. stock verification
C. stock reorder
D. stock reconciliation
E. stock acquisition

14. The Act that empowers the Accountant-General of the Federation to prepare and submit the annual financial statements to the Auditor-General for the Federation is

A. Fiscal Responsibility Act 2007
B. Revenue Mobilisation & Fiscal Allocation Act 2004
C. Allocation of Revenue (Federation Account) Act 2004
D. Finance (Control and Management) Act 2004
E. Financial Intelligence Unit Act 2018

15. Irrespective of the provisions in the Financial Regulations, no payment should be conducted unless approval has been granted by the Honourable Minister of Finance on the recommendation of the

A. Accountant-General of the Federation
B. Auditor-General for the Federation
C. Chairman, Senate Committee on Finance
D. Permanent Secretary, Ministry of Finance
E. President, Federal Republic of Nigeria

16. Statutory deductions in a pay slip of a civil servant includes the following, **EXCEPT**

A. National Housing Fund (NHF)
B. Cooperative deduction

C. Pension contribution
D. P.A.Y.E (Tax)
E. National Health Insurance Fund (NHIF)

17. In investment appraisal, ..... takes into consideration the time value of money.

i. Payback period
ii. Accounting rate of return (ARR)
iii. Net present value (NPV)
iv. Internal rate of return (IRR)
v. Break-even analysis

A. i only
B. ii only
C. iii and iv
D. iii only
E. v only

18. Instituting a sound internal control system in the public sector is one of the functions of the

A. Accounting officer
B. Officer controlling expenditure
C. Internal auditor
D. Treasury officer
E. Inventory office

19. ..... is an audit determining whether an entity's financial information is presented in accordance with an applicable financial reporting and regulatory framework.

A. Regulatory
B. Internal audit
C. Back duty audit
D. External audit
E. Vouching

20. What is the discounted value of a cash-inflow of ₦10,000 in year 1 (one), with assumed cost of capital of 10%?

A. ₦9,090
B. ₦8,264

C. ₦7,513
D. ₦6,830
E. ₦6,209

21. Which of the following is the subject matter of the International Public Sector Accounting Standard No. 39?

A. Construction contract
B. Borrowing cost
C. Employees benefit
D. Lease
E. Retirement benefits plan

22. Which of these is **NOT** an advantage of self-accounting unit?

A. Top management are relieved of work overload
B. Operational decision-making are faster
C. Communication problems are reduced to the minimum
D. Duplication of certain services are inevitable
E. Flexibility is enhanced

23. Which of the following is **NOT** the importance of bank reconciliation?

A. It discloses any unauthorised cheque issued and cashed
B. It negates the usefulness of accounting system
C. It reveals any dishonoured cheques for which receipts have been obtained for payment into government account
D. It discloses fraudulent or fake pay-in-slip purported to have been obtained for paying into government account
E. It reveals any lodgements not credited by the bank either by omission or commission

24. Recording, analysis, classifying and summarising are the ..... of public sector accounting

A. Features
B. Processes
C. Functions
D. Principles
E. Objectives

25. Which one of the following is **NOT** a measure that can be instituted to control imprest?

A. There should be no lending to employees from the imprest money
B. Payment voucher should be raised for all disbursement
C. Imprest money should be used for all purposes
D. Any expenditure from imprest money should be properly authorized and approved
E. Imprest book must be balanced regularly

26. Which of the following is the Chief Executive Officer of the Local Government?

A. Secretary to the Local Government
B. Treasurer
C. Chairman
D. Head of Personnel Management
E. Supervisor

27. Which of the following is **NOT** a Revenue agent of the government?

A. Nigerian Midstream and Downstream Regulatory Authority
B. Federal Inland Revenue Service
C. States Board of Internal Revenue Service
D. Nigeria Customs Service
E. Revenue Mobilization, Allocation and Fiscal Commission

28. The following are items of Consolidated Revenue Funds, **EXCEPT**

A. Statutory allocation
B. License
C. Earnings and sales
D. Custom and excise
E. Armed forces

29. Which of the following is **NOT** a permissive source of Local Government revenue?

A. Tenement rates
B. Birth, marriage, and death registration fees
C. Proceeds of sale of seized goods, boarded vehicles
D. Motor park levies
E. Domestic animal license fees

30. The core objectives for IPSAS 33 are as follows, **EXCEPT**

A. To provides transparent reporting about a first-time adopter's transition to Accrual Basis IPSASs

B. To provides a suitable starting point for accounting in accordance with Accrual Basis IPSASs irrespective of the basis of accounting the first-time adopter had used prior to the date of adoption

C. Where the benefits are expected to exceed the costs

D. A first-time adopter must comply with the recognition, measurement, presentation and disclosure requirements in the other Accrual Basis

E. To harmonise accounting and auditing standards with IFRSs

## SECTION A: PART II SHORT ANSWER QUESTIONS (20 MARKS)

### ATTEMPT ALL QUESTIONS

**Write the correct answer that best completes each of the following questions/statements.**

1. The National Chart of Accounts segment that assigns responsibility for each transaction whether revenue centre (receipt) or cost centre (payment) is .....

2. In the event of the death of an employee, his entitlement under the life insurance policy maintained shall be paid to his.....

3. Who is responsible for the preparation of the Medium-Term Expenditure Framework?

4. Invitations to bid set up by the Bureau for Public Procurement from time to time to monitor monetary thresholds for which procurements shall fall under either system of ..... or .....

5. A standing committee responsible for considering all cases involving loss of cash, inventories and assets of the Federal Government is .....

6. The fund meant to finance general capital projects, such as construction of government buildings is referred to as .....

7. The responsibility for monitoring and reporting on budget implementation by budget office is vested on it by ..... Act.

8. When money bills are passed, they become .....

9. The book that is used in recording all receipts and payments of any nature, being "above-the-line or "below –the-line" is .....

10. ..... is the estimated amount that an entity would currently obtain from disposal of an asset after deducting the estimated cost of disposal, if the asset is already of the age and in the condition expected at the end of its useful life.

11. The ..... officers from the treasury often visit ministries and departments to oversee the accounting systems in place.

12. The ..... warrants allow an officer to spend more than the budgeted amount.

13. The administrative guidelines, and the systems of checks and balances as well as responsibilities of all officers in a local government is .....

14. The public fund established for any unbudgeted expenditure is .....

15. In line with the Financial Regulations 605, a payment voucher shall be operated and supervised by .....

16. The investment method that focuses on the time taken by an investment to recoup the amount of money invested in the project is .....

17. With the introduction of the Open Treasury System, the Office of the Accountant-General of the Federation is required to publish payments above ....., while Ministries, Departments and Agencies (MDAs) are required to publish payments above .....

18. ..... is the check of the relevance and adequacy of the supporting documents of a transaction.

19. The two components of TSA are ..... and .....

20. Using the net present value for investment appraisal, will the cash flows of the entire life of a project be taken into consideration? **'YES OR NO'**

**SECTION B: ATTEMPT ANY FOUR QUESTIONS (50 MARKS)**

**QUESTION 1**

COAB State Government has consistently complied with the extant guidelines and provisions stipulated by the IPSAS accrual basis in preparing its Annual Financial Statement since adoption in 2016.

The following information relating to the budget was made available as at December 31, 2022*:*

| **Receipts** | ₦ |
|---|---|
| **Actual Budget** | |
| Receipt from loans | 29,498,603 |
| Investment income | 89,445 |
| Capital receipts | 9,999,629 |
| Grants | 4,612,803 |
| Federal transfers | 22,914,826 |
| Taxes | 44,596,454 |

| **Final Budget** | ₦ |
|---|---|
| Receipt from loans | 13,500,457 |
| Investment income | 262,500 |
| Capital receipts | 33,362,452 |
| Grants | 7,996,965 |
| Federal transfers | 16,186,200 |
| Taxes | 43,750,000 |

**Payments**

| **Actual Budget** | ₦ |
|---|---|
| Facility repayment | 18,729,079 |
| Overhead cost | 12,533,867 |
| Capital expenditure | 38,117,074 |
| Personnel cost | 21,344,713 |
| Debt charges | 6,359,326 |
| Subvention overhead | 8,476,186 |

| **Final Budget** | ₦ |
|---|---|
| Facility repayment | 10,873,161 |
| Overhead cost | 17,063,519 |
| Capital expenditure | 52,509,547 |
| Personnel cost | 20,768,055 |
| Debt charges | 1,708,936 |
| Subvention overhead | 12,135,356 |

**Note***:* Final budget is original Budget adjusted for all changes applicable to the budget period provided by the State*.*

***Required:***

(a) Prepare the Extract statement of financial performance showing budget information for the relevant year*.* (11 Marks)

(b) What is budgetary control? (1 ½ Marks)

**(Total 12½ Marks)**

AT/262/PII.6

## QUESTION 2

(a) State the main differences between IPSAS 39 and IPSAS 25 under the following headings:

i. Recognition (1 Mark)
ii. Presentation (1 Mark)
iii. Disclosure (1 Mark)
iv. Scope (1 Mark)

(b) Mr Oripipe, a payroll officer of Ministry of Food Infrastructure extracted the following information from the payroll for the month of June 2025. It is the policy of the ministry to pay its staff one month in arrears.

| | ₦ |
|---|---|
| Gross salary | 7,533,000 |
| PAYE deduction | 1,050,000 |
| Pension deduction | 600,000 |
| Union dues | 150,000 |
| NHIS deduction | 300,000 |
| Housing loan deduction | 15,000 |
| Co-operative contribution | 210,000 |
| Other special deduction | 45,000 |

**Required:**

Show the necessary Journal entries to record the above transactions.

(8½ Marks)
**(Total 12½ Marks)**

## QUESTION 3

(a) What are the main roles of National Assembly in planning and monitoring of public expenditure? (9½ Marks)

(b) List the basic controls exercised over government expenditure to prevent indiscriminate spending of funds. (3 Marks)
**(Total: (12½ Marks)**

## QUESTION 4

(a) State **FIVE** sources for the receipt of inventory items. (5 Marks)

(b) Orelope Local Government Cooperative Stores Limited buys an economy size instant coffee to market under its own brand name. The monthly sales in all its stores, assuming 25 days in a month are 100,000 units. The sales occur evenly throughout the month.

The company currently orders in batches of 50,000 units at a time, and at a price of ₦2.50 per unit, with a lead-time of 15 days. A base inventory of 25,000 units is maintained as a buffer stock.

**Required:**

Calculate:

i. Re-order level, and (2½ Marks)

ii. Cost of holding stocks. (5 Marks)

**(Total 12½ Marks)**

## QUESTION 5

(a) Differentiate between internal audit and internal control. (4 Marks)

(b) Mention and explain **THREE** features of a good internal control system. (4½ Marks)

(c) Explain any **FOUR** areas where Auditor-General for the Federation or external auditor of a government MDA may require a specialist. (4 Marks)

**(Total 12½ Marks)**

## QUESTION 6

The Office of the Accountant General of the Federation have provided you with the detailed balance of Federation Account Allocation Committee (FAAC) July, 2024 estimate in line with revenue derivative as follows:

| | **₦'000** |
|---|---|
| Federation accounts | 125,000 |
| Value added tax (VAT) and | 257,000 |
| Consolidated Revenue Fund (CRF) | 95,000 |

**Additional Information:**

(a) The Federation Accounts comprises of oil revenues and non-oil revenues in ratio 3:2 respectively.

(b) The Value Added Tax (VAT) is to be apportioned as follows:

| | |
|---|---|
| Federal government | 15% |
| States governments | 35% |
| Local governments | 50% |

(c) The Consolidated Revenue Fund Accounts are in proportion of 1:2:3:4 as follows: Licences, Fees, Rent, and Mining respectively.

(d) The sharing ratio is as follows:

| | | |
|---|---|---|
| i. | Federal government of Nigeria | 52.68% |
| ii. | State governments in Nigeria | 26.72% |
| iii. | Local governments in Nigeria | 20.60% |
| | **Total** | **100%** |

**Required:**

Prepare a summary of:

i. Federation accounts, and (8 ½ Marks)

ii. Consolidated revenue funds account. (4 Marks)

**(Total 12½ Marks)**

**SOUTIONS**

**SECTION A: PART I**

1. D
2. D
3. A
4. C
5. BONUS
6. C
7. A
8. C
9. E
10. B
11. A
12. C
13. B
14. D
15. A
16. B
17. C & D
18. A
19. A & B
20. A
21. C
22. D

23. B

24. B

25. C

26. C

27. E

28. D

29. C

30. E

## Examiner's comment

This consists of 30 – compulsory multiple choice questions that requires the candidates to write only the alphabet that corresponds to the correct option in each question/statement. About 99.9% of the candidates attempted the questions. About 80% of them scored above the 50% of total marks obtainable.

The commonest pit-falls was as a result of the poor preparation by some of the candidates. Candidates are enjoined to cover every areas of the syllabus. They should familiarize themselves with the Institutes' Study Text and also with past questions of previous diets examination for future exams.

## SECTION A: PART II

1. Administrative segment

2. Next-of-kin / Designated Survivor

3. Minister of Finance

4. National or International Competitive Bidding

5. Federal Losses Committee

6. Statement No.4 - Statement of Development Fund (or Capital Expenditure)

7. Fiscal Responsibility Act

8. Appropriation Acts,

9. Treasury Cash book

10. Residual Value

11. Inspectorate

12. Virement, Supplementary and Contingency Warrants

13. Financial Memorandum

14. Contingency Fund

15. Officer Controlling Expenditure (OCE) / Sub-Accounting Officer

16. Payback Period

17. 10 million, 5 million. (Note: half mark each)

18. Vouching

19. E-collection and E-payment

20. Yes

## Examiner's comment

This consists of 20 compulsory short answer questions that requires the candidates to write the correct answer that best completes each of the questions/statements.

About 99.9% of the candidates attempted the questions. About 30% of them scored above 50% of marks obtainable.

The commonest pit-falls was the failure by some candidates to cover every area of the syllabus.

Candidates are enjoined to make adequate use of the Institute's study text. They should endeavour to cover the syllabus and familiarise with previous diets examination questions.

**SECTION B**

**SOLUTION 1**

1a. COAB State Government
Extract Statement of Financial Performance showing budget information
for the year ended December 31, 2022

| Description | Current year Actual Budget | Final budget for current year | Supplementary budget | Original budget | Difference between Final and Actual |
|---|---|---|---|---|---|
| RECEIPTS | ₦ | ₦ | ₦ | ₦ | ₦ |
| Receipt from loans | 29,498,603 | 13,500,457 | Nil | Nil | (15,998,146) |
| Investment income | 89,445 | 262,500 | Nil | Nil | 173,055 |
| Capital receipts | 9,999,629 | 33,362,452 | Nil | Nil | 23,362,823 |
| Grants | 4,612,803 | 7,996,965 | Nil | Nil | 3,384,162 |
| Federal transfers | 22,914,826 | 16,186,200 | Nil | Nil | (6,728,626) |
| Taxes | 44,596,454 | 43,750,000 | Nil | Nil | (846,454) |
| TOTAL RECEIPTS | 111,711,760 | 115,058,574 | Nil | Nil | 3,346,814 |
| PAYMENTS | | | | | |
| Facility repayment | 18,729,079 | 10,873,161 | Nil | Nil | (7,855,918) |
| Overhead cost | 12,533,867 | 17,063,519 | Nil | Nil | 4,529,652 |
| Capital expenditure | 38,117,074 | 52,509,547 | Nil | Nil | 14,392,473 |
| Personnel cost | 21,344,713 | 20,768,055 | Nil | Nil | (576,658) |
| Debt charges | 6,359,326 | 1,708,936 | Nil | Nil | (4,650,390) |
| Subvention overhead | 8,476,186 | 12,135,356 | Nil | Nil | 3,659,170 |
| TOTAL PAYMENTS | 105,560,245 | 115,058,574 | Nil | Nil | 9,498,329 |
| Net receipts/(payments) | 6,151,515 | Nil | Nil | Nil | 6,151,515 |

**1b. Budgetary control**

i. It is the whole system of controls - financial or otherwise - to ensure that income and expenditure are in line with the budget and that wastage is reduced to the barest minimum.

ii. Budgetary control is a positive and integral part of a public sector organisation's planning and appraisal activities so as to achieve the set objectives.

iii. In other words, budgetary control is a process of comparing the actual with budgeted activity, resulting in a variance, which could be favourable or adverse.

## Examiner's comment

The question tests the candidates' knowledge and understanding of the IPSAS accrual basis in the preparation of the Annual Financial statement. It requires the candidates to prepare extract statement of financial performance, showing budget information for the relevant year. It also required candidates to explain the term "budgetary control".

About 80% of the candidates attempted the question and about 60% of them scored above 50% of the marks obtainable. The commonest pit-falls was the inability of some candidates to interpret the requirement of the examiner.

Candidates are enjoined to endeavour to cover every areas of the syllabus. They should make adequate use of the Institute's study text as well as familiarize themselves with the past questions of the previous diets examinations.

## SOLUTION 2

2a. Differences between IPSAS 39 and IPSAS 25

i. Recognition: Currently IPSAS 25 permits public sector organisations to defer recognition of certain acturial gains and losses arising from defined benefit plans (the "corridor approach"). IPSAS 39 removed the "corridor approach".

ii. Presentation: IPSAS 39 eliminates presentational options on acturial gains and losses that previously existed in IPSAS 25.

iii. Disclosure: IPSAS 39 introduces disclosure objectives for defined benefit plans according to the characteristics, risk associated with them and their relationship with an organisation's financial statements.

iv. Scope: IPSAS 25 applies to all public sector entities other than Government Business Enterprises while IPSAS 39 applies to all public sector organisations, Government Business Enterprises and private sector organisations.

**b.**

**Ministry of Food Infrastructure**
**Journal**

| | DR (₦) | CR (₦) |
|---|---|---|
| Gross salary | 7,533,000 | |
| Payee deduction | | 1,050,000 |
| Pension deduction | | 600,000 |
| Union due | | 150,000 |
| NHIS | | 300,000 |
| Housing loan deduction | | 15,000 |
| Cooperative deduction | | 210,000 |
| Other special deduction | | 45,000 |
| Net salary payable | | 5,163,000 |
| Being recognition of gross salary, deductions and net salary payable for the month of June, 2024 | | |
| Payee deduction | 1,050,000 | |
| Pension deduction | 600,000 | |
| Union due | 150,000 | |
| NHIS | 300,000 | |
| Housing loan deduction | 15,000 | |
| Cooperative deduction | 210,000 | |
| Other special deduction | 45,000 | |
| Net salary payable | 5,163,000 | |
| Bank | | 7,533,000 |
| Being payment of outstanding June 2024 salary in July 2024 | | |
| | | |

**Examiner's comment**

The question which was divided into two parts: "a" and "b", tests the candidates' knowledge and understanding of the difference between IPSAS 39 and IPSAS 25, under- Recognition; Presentation; disclosure and scope. It also required the candidates to show the journal entries to record a given transaction.

About 25% of the candidates attempted the question, and about 10% of them scored above 50% of total marks obtainable.

The commonest pitfalls was the inability of some candidates to cover the syllabus. Candidates are advised to ensure that, they cover every areas of the syllabus. They should make adequate use of the Institute's study text and previous diets' examination questions.

**SOLUTION 3**

**(a) ROLES OF THE NATIONAL ASSEMBLY IN PLANNING AND MONITORING PUBLIC EXPENDITURE**

i. **Approval of the Annual Budget**
The National Assembly reviews, amends where necessary, and approves the Appropriation Bill submitted by the Executive. No public expenditure can legally occur without this approval.

ii. **Scrutiny of Budget Estimates**
They examine detailed revenue and expenditure proposals from Ministries, Departments, and Agencies (MDAs) to ensure alignment with national priorities and fiscal sustainability.

iii. **Enactment of Fiscal and Financial Laws**
They pass laws such as the Appropriation Act, Finance Act, and other fiscal regulations that govern how public funds are raised, allocated, and spent.

iv. **Approval of Supplementary Budgets**
When the Executive requires additional funds beyond the approved budget, the National Assembly considers and approves supplementary appropriations.

v. **Oversight of Budget Implementation**
Through committees (e.g., Public Accounts Committee, Finance Committee), they monitor how MDAs implement the budget to ensure compliance with approved votes.

vi. **Review of Auditor-General's Reports**
They examine audit reports on government accounts and ensure corrective actions are taken on irregularities, waste, or mismanagement of public funds.

vii. **Authorization of Government Borrowing**
Certain borrowing activities, especially external loans; require National Assembly approval to prevent unsustainable debt accumulation.

viii. **Monitoring Public Expenditure Performance**
They evaluate whether public funds are used economically, efficiently, and effectively, ensuring value for money in government spending.

ix. **Ensuring Accountability and Transparency**
They demand periodic reports from MDAs, summon officials for questioning, and enforce compliance with financial regulations.

x. **Protection of Public Interest**
By controlling public expenditure, they ensure that spending aligns with national development goals and protects citizens from misuse of public resources.

## (b) CONTROLS EXERCISE OVER GOVERNMENT EXPENDITURE TO PREVENT INDISCRIMINATE SPENDING OF FUNDS

i. Financial Control

ii. Legislative Control

iii. Expenditure Control

iv. Treasury Control

v. Departmental Control.

vi. Ministry of Finance Control: The Minister of Finance has other controls over government expenditure through the following:

vii. Issuance of financial authorities.

viii. Compilation and tentative approval of the Nation's budget.

ix. Issuance of budgetary guidelines.

x. Issuance of financial regulations

xi. Issuance of financial circulars.

### Examiner's comment

The question tests the candidates' knowledge and understanding of the roles of National Assembly in planning and monitoring of public expenditure. It also required the candidates to list the basic controls exercised over government expenditure to prevent indiscriminate spending of funds.

About 70% of the candidates attempted the question and about 20% of them scored above 50% of the total marks obtainable.

AT/262/PII.6

The commonest pitfalls was the inability of some candidates to identify the main roles of National Assembly in planning and monitoring of public expenditure.

Candidates are enjoined to cover every areas of the syllabus. They should make adequate use of the Institute's study text and other recommended reference materials for future examinations.

## SOLUTION 4

(a) **Receipt of inventories**

The sources of inventory items are from the following:

i. Acquisitions through local purchase orders;

ii. Transfers from other inventories;

iii. Converted or Manufactured goods;

iv. Acquisitions through letters of awards;

v. Returned inventories;

vi. Excess taken on charge; and

vii. Other avenues.

(b) i Calculation of Re-Order level

Re-order level = Safety Stock + Normal usage in lead time
= 25,000 + {100,000 x. 15/25} units
= 25,000 + 60,000
= 85,000. units

Therefore, the Re-order level is when stocks fall to. 85,000 units.

ii Cost of holding stocks

Average stock is: Buffer stock + Order quantity/2
= 25,000 +50,000/2
= 25,000 + 25,000
= 50,000 units

Value (cost of holding stock):

Cost of holding stock = 50,000 × ₦2.50 = ₦125,000

## Examiner's comment

The question tests the candidates' knowledge and understanding of inventories. It required them to state sources of receipt of inventories and to calculate Re-order level and costs of holding stocks.

About 30% of the candidates attempted the question and about 5% of them scored above 50% of total marks obtainable.

The commonest pitfalls was the inability of some candidates to correctly interpret the requirements of the examiner.

Candidates are enjoined to prepare well in their subsequent examinations. They should cover every areas of the syllabus and make adequate use of the Institute's study text.

## SOLUTION 5

(a)

i. Internal audit is an independent appraisal activity within an organisation for the review of accounting, financial and other operations as basis for services to management. An individual designated as internal auditor as a control process carries it out. In Government, audit certificates are issued before contractors and suppliers are paid.

ii. Internal Control can be defined as the "whole system of controls, financial or otherwise, established by the management with a view to carry on the business of an entity in a manner that will protect the assets and place reliability on the records of the entity.''

(b) **Important features of internal control**

i. Segregation of duty: This is by employing division of labour so that the work in one place or department will be different from another department and carried out by different people.

ii. Established organisation structure: All the duties and powers of an officer should be clearly defined so that an officer would know what is required and expected of him.

iii. Perusal of Records: This is by checking the work done earlier and correct any anomaly, error or omission detected timely.

iv. Acknowledgement of Deed: This is by appending signature or initials on work done by an officer or by a senior officer to ascertain that the task is already done.

v. Asset protection: This is by keeping all records and statutory documents under lock and key and obtaining insurance policy on physical assets.

vi. Formality: All transfer and receipt of stores have to be backed up by authorised requisition vouchers and acknowledged by signing appropriate vouchers.

vii. Verification: All items purchased must be verified for completeness, accuracy and that they meet the required standard and specifications.

In some cases the Auditor-General or external auditor may have to rely on the work of specialists to form his audit opinion. Examples of such situations are:

i. Valuations of type of assets, for example, lands, buildings, machinery, minerals, etc.;

ii. Measurement of work completed, in progress or to be completed on long term contracts, Architects, engineers etc.;

iii. Legal interpretation of agreement or statutes;

iv. Physical stock taking of specialised stores e.g. drugs or chemicals; and

v. Determination of amounts using specialised techniques or methods, for example, an actuarial valuation.

vi. Information Technology (IT) Systems and Cybersecurity

vii. Environmental and Scientific Audits

viii. Forensic Investigations

ix. Medical and Health-Related Audits

x. Environmental Health and Safety (EHS) Compliance

xi. Geological and Mineral Resource Audits

## Examiner's comment

The question tests the candidates' knowledge and understanding of internal audit and internal control. It requires the candidates to differentiate between internal audit and internal control, as well as to explain features of a good internal control system. The "c" part required for areas where Auditor-General for the Federation or external auditor of a government MDA may require a specialist.

About 80% of the candidates attempted the question, and about 20% of them scored above 50% of total marks obtainable.

The commonest pitfall was in the differentiation between internal audit and internal control.

Candidates are enjoined to endeavour to cover every areas of the syllabus. They should make adequate use of the Institute's study text as well as past examination questions of previous diets.

## SOLUTION 6

Office of the Accountant General of the Federation

Computation of Federation Accounts For the month of July,2024

i.

| Federation Accounts | ₦' Million | |
|---|---|---|
| Oil Revenue: $^{3}/_{5}$ @ N125, 000 million | | 75,000* |
| Non-Oil Revenue: $^{2}/_{5}$ @ N125, 000 million | | 50,000* |
| Total Federation Accounts | | 125,000P |
| The sharing ratio is as follows: | | |
| Federal government of Nigeria | 52.68%* | 65,850* |
| State governments in Nigeria | 26.72%* | 33,400* |
| Local governments in Nigeria | 20.60%* | 25,750* |
| Total | 100% | 125,000* |

Value Added Tax (VAT)

The Value Added Tax (VAT) is to be apportioned as follows:

| | | | |
|---|---|---|---|
| (i) | Federal Government | 15%* | 38,550* |
| (ii) | States Governments | 35%* | 89,950* |
| (iii) | Local Governments | 50%* | 128,500* |
| Total | | 100% | N257, 000* |

AT/262/PII.6

ii. Consolidated Revenue Funds

| | Ratios | |
|---|---|---|
| License | 1 | 9,500* |
| Fees | 2 | 19,000* |
| Rent | 3 | 28,500* |
| Mining | 4 | 38,000* |
| | | 95,000* |
| Transfer from Federation Account | | 65,850* |
| Share of VAT | | 38,550* |
| TOTAL | | 199,400* |

## Examiner's comment

The question tests the candidates' knowledge and understanding of Federation Account; Consolidated Revenue Fund (CRF) and Value Added Tax. It requires the candidate to prepare a summary of Federation accounts and Consolidated revenue funds account.

About 60% of the candidates attempted the question. About 30% of them scored above 50% of the total marks obtainable.

The commonest pitfall was the inability of some candidates to prepare the Federation accounts.

Candidates are enjoined to follow carefully the requirements of the examiner while attempting the questions. They are also advised to make use of the Institute's study text and familiarize themselves with past questions of previous diet's examinations.

**THE ASSOCIATION OF ACCOUNTANCY BODIES IN WEST AFRICA**

**ACCOUNTING TECHNICIANS SCHEME, WEST AFRICA**
**SEPTEMBER 2026 EXAMINATIONS (PART II)**

# QUANTITATIVE ANALYSIS

**PLEASE READ THESE INSTRUCTIONS BEFORE COMMENCEMENT OF THE PAPER**

# EXAMINATION INSTRUCTIONS

1. All solutions should be in **blue** or **black** ink. Any solution in pencil will not be marked.
2. Read all instructions on each part of the paper carefully before answering the questions.
3. Ensure that you do not answer more than the number of questions required for **Section B (The Essay Section).**
4. Check your pockets, purse and mathematical sets, etc, to ensure that you do not have prohibited items such as telephone handset, electronic storage device, wrist watches, programmable devices or any form of written material on or around you in the examination hall. You will be stopped from continuing with the examination and liable to further disciplinary actions including cancellation of examination result if caught.
5. Do not enter the hall with anything written on your docket.
6. Insert your examination number in the space provided above.

**WEDNESDAY, SEPTEMBER 23, 2026**

**DO NOT TURN OVER UNTIL YOU ARE TOLD TO DO SO**

**THE ASSOCIATION OF ACCOUNTANCY BODIES IN WEST AFRICA**
**ACCOUNTING TECHNICIANS SCHEME, WEST AFRICA**
**PART II EXAMINATIONS – SEPTEMBER 2026**

**QUANTITATIVE ANALYSIS**

**Time Allowed: 3 hours**

**SECTION A: PART I MULTIPLE CHOICE QUESTIONS (30 MARKS)**

**ATTEMPT ALL QUESTIONS IN THIS SECTION**

**Write ONLY the alphabet (A, B, C, D or E) that corresponds to the correct option in each of the following questions/statements:**

1. Temperature: 16°C' is an example of

   A. Non-numeric data
   B. Categorical data
   C. Text data
   D. Nominal data
   E. Numeric data

2. The median of the following data set: 1, 9, 7, 13, 5, 15, 11, 3, is

   A. 8
   B. 9
   C. 10
   D. 11
   E. 12

3. The ages of pupils in a certain school are distributed as follows:

| Age (Years) | Frequency |
|---|---|
| 5-15 | 3 |
| 16-25 | 6 |
| 26-35 | 9 |

   The range of the dataset is

   A. 25
   B. 30
   C. 35
   D. 40
   E. 45

4. The following data show the marks obtained by candidates in a particular subject:

| Class Interval | Frequency |
|---|---|
| 1-10 | 5 |
| 11-20 | 10 |
| 21-30 | 15 |
| 31-40 | 10 |
| 41-50 | 5 |

The coefficient of variation for the distribution is .....

A. 40.2%
B. 45.3%
C. 47.1%
D. 220.9%
E. 522.9%

5. A researcher calculated the following values for a sample of 10 data points: $\sum x = 50, \sum y = 60, \sum x^2 = 300, \sum y^2 = 400, \sum xy = 320$. The correlation coefficient (r) is .....

A. 0.45
B. 0.55
C. 0.65
D. 0.75
E. 0.85

6. A manufacturing company compares three suppliers, P, Q and R, based on the cost of raw materials, as follows:

| Supplier | Standard deviation of cost (GH¢'000) | Average cost per unit (GH¢'000) |
|---|---|---|
| P | 3 | 60 |
| Q | 5 | 50 |
| R | 4 | 55 |

The supplier(s) that offers the most consistent pricing is/are

A. Supplier P
B. Supplier Q
C. Supplier R
D. Suppliers P and Q
E. Suppliers Q and R

7. Which of the following is a characteristic of an additive time series model?

   A. The seasonal component is proportional to the trend
   B. The seasonal component is constant over time
   C. The cyclical component is random
   D. The irregular component is predictable
   E. The trend component is non-linear

8. Given the prices of three commodities A, B and C in the base year and current year as follows:

| Commodity | Base Year Price | Current Year Price |
|---|---|---|
| A | 10 | 12 |
| B | 20 | 25 |
| C | 30 | 35 |

   The simple aggregate price index is

   A. 115
   B. 120
   C. 121.67
   D. 125
   E. 130

9. The probability of an event can be defined as

   A. Number of favourable outcomes × Total number of possible outcomes
   B. Total number of possible outcomes / Number of favourable outcomes
   C. Number of unfavourable outcomes / Total number of possible outcomes
   D. Number of favourable outcomes / Total number of possible outcomes
   E. Total number of unfavourable outcomes x Number of favourable outcomes

10. The expected value of a discrete random variable can be calculated by

   A. Adding up all the possible outcomes
   B. Subtracting the smallest outcome from the largest outcome
   C. Dividing the variance of all the outcomes by the sum of their individual probabilities
   D. Multiplying each outcome by its probability and summing the results
   E. Dividing the sum of the outcomes by the number of outcomes

11. One main characteristic of a good hypothesis is that it is

   A. Vague and ambiguous

B. Specific and testable
C. Based on personal opinion
D. Proven by prior research
E. Complex and multifaceted

12. A data set has the following quartiles: $Q_1 = 25$, $Q_2$ (median) = 30 and $Q_3$ = 40. The quartile deviation is

A. 7.5
B. 10
C. 12.5
D. 15
E. 20

13. If the cash flow of a business for the third year is ₦650,000, calculate its corresponding present value based on a discounting factor of 8%.

A. ₦215,970
B. ₦315,970
C. ₦415,970
D. ₦515,970
E. ₦615,970

14. A five working day weekly deposits by two customers A and B (in millions of Naira) are respectively $A = \{3, 2, 1, 4, 8\}$ $and$ $B = \{8, 9, 4, 5, 7\}$, , where the universal set$U = \{x,$ an integer $|1 \leq x < 10\}$. Find $n[(A \cup B)^c]$.

A. 5
B. 4
C. 3
D. 2
E. 1

15. A sum of Le1million was spent to set up a mini factory to produce bars of soap. If a bar of soap costs Le200 to produce and it sells for Le550, find the minimum quantity of the bar soap to be produced and sold to make a profit of at least Le19,900

A. 1,914
B. 2,914
C. 3,914
D. 4,914
E. 5,914

16. The following formula is used to calculate the present value of a single amount:

A. $PV = FV \times (1+r)^n$

B. $PV = \dfrac{FV}{(1+r)^n}$

C. $PV = FV \times r \times n$

D. $PV = \dfrac{FV}{r}$

E. $PV = FV \times n$

17. A firm's profit, derived from differentiation efforts, is modelled by the equation $P(\mathrm{x}) = 500 + 8\,\mathrm{x} - 3\,\mathrm{x}^2$, where x (in thousands) represents the quantity of goods sold. The quantity of goods sold (x) that maximises the profit is

A. 333
B. 1,333
C. 2,333
D. 3,333
E. 5,333

18. If the marginal cost function of a company is given by $MC(\mathrm{x}) = 3\,\mathrm{x}^2 + 2\,\mathrm{x}$, the corresponding total cost function is

A. $TC(\mathrm{x}) = \mathrm{x}^3 + \mathrm{x}^2 + C$
B. $TC(\mathrm{x}) = \mathrm{x}^3 - \mathrm{x}^2 + C$
C. $TC(\mathrm{x}) = \mathrm{x}^3 + \mathrm{x}^2 + \mathrm{x} + C$
D. $TC(\mathrm{x}) = 3\,\mathrm{x}^3 + 2\,\mathrm{x}^2 + C$
E. $TC(\mathrm{x}) = \mathrm{x}^2 + \mathrm{x} + C$

19. Operations Research (OR) contributes to decision-making in business by

A. providing intuitive insights
B. analysing data and optimising solutions
C. relying on past experiences
D. ignoring uncertainty
E. focusing on short-term gains

20. A company has an annual demand of 15,000 units. The ordering cost per order is ₦250, and the annual holding cost per unit is ₦12. The EOQ is

A. 500 units
B. 600 units
C. 750 units

D. 791 units
E. 1000 units

21. A key characteristic of Linear Programming (LP) problems is that they have

A. a nonlinear objective function
B. nonlinear constraints
C. A linear objective function and linear constraints
D. Integer-valued decision variables
E. stochastic parameters

22. A small project has the following cash flows:

Year 0: ₦10,000
Year 1: ₦3,000
Year 2: ₦4,000
Year 3: ₦5,000

The Net Present Value (NPV) of the project, given a discount rate of 10%, is

A. −₦110.37
B. +₦110.37
C. −₦210.37
D. +₦210.37
E. ₦5,000.37

23. The optimal solution, in a maximisation problem, using the graphical method, is the

A. Point where the objective function line intersects the x-axis
B. Point where the objective function line intersects the y-axis
C. Farthest corner point of the feasible region in the direction of the objective function
D. Closest corner point of the feasible region to the origin
E. Midpoint of the feasible region

24. A company's ordering cost per unit is Le0.10. They anticipate an annual demand of 100,000 units. If the total ordering cost is Le1,000,000 the number of orders placed per year is .....

A. 100
B. 1,000
C. 10,000
D. 100,000
E. 1,000,000

25. A project manager has identified a critical path with a duration of 18 days. If one activity on the critical path is delayed by 3 days, the overall project duration is

A. 3 days
B. 15 days
C. 18 days
D. 21 days
E. 24 days

26. The primary goal of Critical Path Analysis (CPA) is to

A. Determine the minimum project duration
B. Minimise project costs
C. Maximise project quality
D. Allocate resources efficiently
E. Identify project risks

27. In a group replacement policy, the annual operating cost per machine is GH¢3,000. The total cost of replacing the entire group every 4 years is GH¢12,00,000 for 50 machines. The approximate average annual cost per machine is .....

A. GH¢6,000
B. GH¢8,200
C. GH¢8,800
D. GH¢9,000
E. GH¢12,000

28. A dummy column introduced in an unbalanced transportation problem represents a

A. Real demand point
B. Real supply point
C. Fictitious demand point to balance the problem
D. Fictitious supply point to balance the problem
E. Point with zero demand

29. The following cost matrix shows the costs of assigning three workers: $W_1$, $W_2$ and $W_3$ to three projects: $P_1$, $P_2$ and $P_3$:

| Project / Worker | $P_1$ | $P_2$ | $P_3$ |
|---|---|---|---|
| $W_1$ | 8 | 6 | 9 |
| $W_2$ | 9 | 7 | 8 |
| $W_3$ | 10 | 9 | 7 |

Use the Least Cost Method to find the first and second assignments.

A. $W_1$ to $P_2$ and $W_3$ to $P_3$ respectively
B. $W_3$ to $P_3$ and $W_1$ to $P_3$ respectively
C. $W_2$ to $P_1$ and $W_2$ to $P_3$ respectively
D. $W_3$ to $P_3$ and $W_2$ to $P_3$ respectively
E. $W_1$ to $P_1$ and $W_2$ to $P_3$ respectively

30. The limitation of the North-West Corner Method (NWCM) in solving transportation problems is that it

A. provides an optimal solution
B. is computationally complex
C. may not provide the desired optimal initial basic feasible solution
D. ignores supply and demand constraints
E. is only applicable to large problems

## SECTION A: PART II SHORTANSWER QUESTIONS (20 MARKS)

### ATTEMPT ALL QUESTIONS

**Write the correct answer that best completes each of the following questions/statements:**

1. The entire group of individuals, items, or observations that are of interest to the researcher, about which inferences are to be made, is known as the .....

2. If the ages of four students are: 12, 15, 12 and 14 years, then, the mode of these ages is .....

3. The data of the number of books read by five students is: 3, 5, 4, 6, 5. Calculate the mean deviation of the data.

4. One common method used for fitting a simple linear regression line is the ..... method.

5. A business recorded sales $(y)$ over 3 months $(x)$ and the following are obtained:
$\sum x = 6$, $\sum y = 660$, $\sum xy = 1360$ and $\sum x^2 = 14$. If the trend line model for the business is $y = a + bx$, the values of $a$ and $b$ are..... and ..... respectively

6. The following data relates to a product:

| Product | Base Year Price | Current Year Price | Base Year Quantity |
|---|---|---|---|
| A | 2 | 3 | 50 |

The Laspeyres' Price Index is .....

7. In a class, 60% of students pass a mathematics examination and 50% pass a science examination. If 30% pass both, the probability that a randomly selected student passes either mathematics or science is .....

8. A numerical value calculated from sample data that is used to determine whether the null hypothesis should be rejected is called the.....

9. A company's revenue $R(t)$, in thousands of naira, is modelled by the following exponential function: $R(t) = 50e^{0.03t}$, where $t$ is time in years. The rate of change of revenue at $t = 5$ years is ..... per year.

10. A business deposits ₦1,000 at the end of each year into a savings account. If the annual interest rate is 5%, the total amount after 3 years is .....

11. To find the critical points where a function may have a maximum value, the ..... derivative of a function is used.

12. The total revenue of a company, from selling q units, in thousands of naira, is represented by $R(q) = 600q - 3q^2$. The marginal revenue at $q = 50$ is ..... per unit.

13. The effective implementation of Operations Research methodologies enables businesses to ..... operational efficiencies and drive sustainable growth.

14. In LP problem formulation, the ..... is a mathematical representation of the objective to be maximised or minimised.

15. The expense associated with storing and maintaining inventory over time is referred to as ..... of inventory.

16. The amount of time a task can be delayed without affecting the early start date of its successor tasks or the project completion date, assuming all predecessor tasks start as early as possible, is .....

17. A policy that involves replacing individual items or components as they fail or reach the end of their useful life, is .....

18. The Vogel's Approximate Method calculates the ..... cost for each row and column, which represents the difference between the smallest and the next smallest transportation costs.

19. A company needs to send 50 units from supplier X at a cost of Le2 per unit and 50 units from supplier Y at a cost of Le3 per unit. The total transportation cost, if all the units are supplied, is .....

20. A business uses Monte Carlo simulation to estimate the expected profit, which depends on sales volume (random between 120 and 200 units). If the average profit per unit is ₦100, the estimated expected profit is .....

**SECTION B: ATTEMPT ANY FOUR QUESTIONS (50 MARKS)**

**QUESTION 1**

The quantities and prices of a basket of goods containing five items: P, Q, R, X and Y, in the base year (Year 1) and the current year (Year 2), are as follows:

| Item | Quantity in Year 1 | Price in Year 1 ₦ | Quantity in Year 2 | Price in Year 2 ₦ |
|---|---|---|---|---|
| P | 6 | 8,000 | 8 | 5,000 |
| Q | 10 | 2,000 | 16 | 4,000 |
| R | 7 | 5,000 | 12 | 6,000 |
| X | 8 | 10,000 | 10 | 12,000 |
| Y | 15 | 4,000 | 18 | 5,000 |

**Required:**

Calculate the following indices:

(a) Laspeyres' Price Index (4½ Marks)

(b) Paasche's Price Index; and (4½ Marks)

(c) Fisher'sIdeal Price Index. (3½ Marks)

**(TOTAL 12½ Marks)**

**QUESTION 2**

The following table shows the number of cartons of Malt drink sold by a retailer in Lagos over ten consecutive months in a year:

| Month | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Sales | 150 | 160 | 155 | 170 | 180 | 190 | 185 | 200 | 210 | 220 |

**Required:**

For the data given above, obtain the trend line, using:

(a) the semi-averages method (3 Marks)

(b) the 3-month moving averages method and (5 Marks)

(c) the Least Squares method. (4½ Marks)

**(TOTAL 12½ Marks)**

**QUESTION 3**

A study investigates the relationship between hours of study (X) and examination scores (Y) for a group of ten QA candidates. The data for the candidates are as follows:

| Candidate | Hours of study (X) | Examination score (Y) |
|---|---|---|
| 1 | 2 | 55 |
| 2 | 3 | 58 |
| 3 | 4 | 62 |
| 4 | 5 | 65 |
| 5 | 6 | 68 |
| 6 | 7 | 70 |
| 7 | 8 | 74 |
| 8 | 9 | 77 |
| 9 | 10 | 80 |
| 10 | 11 | 82 |

**Required:**

(a) Find the equation of the least squares regression line of Y on X. (9½ Marks)

(b) Interpret, in brief, the meaning of the regression constant (intercept) and the regression coefficient (slope) as obtained in part (a) above. (2 Marks)

(c) Use the regression line to predict the examination score of a candidate who studies for 7.5 hours. (1 Mark)

**(TOTAL 12½ Marks)**

## QUESTION 4

A company conducts a survey among 200 customers about their preferences for three products A, B, and C, and the following responses are gathered:

120 customers like Product A, 90 customers like Product B, 80 customers like Product C, 50 customers like both Products A and B, 40 customers like both Products A and C, 30 customers like both Products B and C while 20 customers like all the three products.

**Required:**

(a) Represent this information on an Euler-Venn diagram. (5 ½ Marks)

(b) Determine the number of customers who like exactly one of the three products . (4½ Marks)

(c) Determine the number of customers who do not like any of the three products. (2½ Marks)

**(TOTAL 12½ Marks)**

## QUESTION 5

A factory produces two products: P and Q. The profit per unit for P is GH¢40, and for Q is GH¢30. The production process is constrained by the following resources:

- Machine A: maximum of 100 hours.
- Machine B: maximum of 80 hours.

The resource requirements per unit are tabulated as follows:

| Resource | Product P | Product Q |
|---|---|---|
| Machine A (hours) | 2 | 1 |
| Machine B (hours) | 1 | 2 |

**Required:**

(a) Formulate a linear programming model for maximising the total profit. (2 Marks)

(b) Find the optimal solution using the graphical method. (5½ Marks)

(c) Calculate the shadow price of each machine and state the economic interpretation of the results. (5 Marks)

**(TOTAL 12½ Marks)**

## QUESTION 6

In a certain company, computer sets utilise resistors that have a lifespan of five months. The failure rates of these resistors, over the five-month period, are provided in the table below:

| Month | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Failure rate (%) | 10 | 30 | 35 | 20 | 5 |

At any given time, 536 resistors are used in the system. The cost of replacing each resistor is ₦10, if replaced as part of a group replacement (all resistors replaced together) and ₦40, if replaced individually (resistors replaced one by one as they fail).

**Required:**

Calculate the

(a) Optimal interval period (in months) between successive group replacements to minimise the total replacement cost. (11½ Marks)

(b) Cost of group replacement at that optimal interval obtained in part (a) above. (1 Mark)

**(TOTAL 12½ Marks)**

# USEFUL FORMULAE

## 1. DESCRIPTIVE STATISTICS

### Arithmetic Mean

For ungrouped data:

$$\bar{x} = \frac{\sum x}{n}$$

For frequency distribution:

$$\bar{x} = \frac{\sum f\, x}{\sum f}$$

Mean Deviation

For ungrouped data:

$$MD = \frac{\sum |\, x - \bar{x}\, |}{n}$$

For grouped data:

$$MD = \frac{\sum f\, |\, x - \bar{x}\, |}{\sum f}$$

Standard Deviation:

$$\sigma = \sqrt{\frac{\sum f\,(x - \bar{x})^2}{\sum f}}$$

Shortcut form:

$$\sigma = \sqrt{\frac{\sum f\, x^2}{\sum f} - \left(\frac{\sum f\, x}{\sum f}\right)^2}$$

Coefficient of Variation

$$CV = \frac{\sigma}{\bar{x}} \times 100$$

## 1. CORRELATION AND REGRESSION

### Pearson's Product Moment Correlation:

$$r = \frac{n\sum xy - \sum x \sum y}{\sqrt{[n\sum x^2 - (\sum x)^2][n\sum y^2 - (\sum y)^2]}}$$

Simple Linear Regression:

$$y = a + bx$$

where

$$b = \frac{n\sum xy - \sum x \sum y}{n\sum x^2 - (\sum x)^2}$$

$$a = \bar{y} - b\bar{x} = \frac{\sum y}{n} - b\frac{\sum x}{n}$$

## 2. TIME SERIES

### Moving Average

$$\text{Moving Average} = \frac{\text{Moving Total}}{\text{Number of periods}}$$

### Least Squares Trend Line

$$y = a + bx$$

where:

$$b = \frac{n\sum xy - \sum x \sum y}{n\sum x^2 - (\sum x)^2}$$

ALITER:

$$y = a + bt$$

where

$t = x_i - x_m$

and $x_m$ is the median value of $x$ values.

$b = \frac{\sum ty}{\sum t^2}$

$a = \bar{y}$

## 3. INDEX NUMBERS

### Simple Aggregate Price Index (SAPI):

$$SAPI = \frac{\sum p_1}{\sum p_0} \times 100$$

**Simple Average of Relative Price Index (SARPI):**

$$SARPI = \frac{\sum \left(\frac{p_1}{p_0} \times 100\right)}{n}$$

Laspeyres' Price Index:

$$I_L = \frac{\sum p_1 q_0}{\sum p_0 q_0} \times 100$$

Paasche's Price Index:

$$I_P = \frac{\sum p_1 q_1}{\sum p_0 q_1} \times 100$$

Fisher's Ideal Index:

$$I_F = \sqrt{I_l \times I_P}$$

Marshall-Edgeworth Index:

$$I_M = \frac{\sum (p_1 q_0 + p_1 q_1)}{\sum (p_0 q_0 + p_0 q_1)} \times 100$$

## 4. PROBABILITY

Expected Value:

$$E(X) = \sum X\, P(X)$$

**Addition Law**

For two events:

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

For mutually exclusive events:

$$P(A \cup B) = P(A) + P(B)$$

## 5. MATHEMATICS OF FINANCE

**Compound Amount:**

$$A = P(1 + r)^n$$

Present Value

$$P = \frac{A}{(1 + r)^n}$$

Future Value of an Annuity

$$S = A\left[\frac{(1 + r)^n - 1}{r}\right],$$

where:
$S$ = future value of the annuity
$A$ = periodic payment
$r$ = interest rate per period
$n$ = number of periods

**Net Present Value:**

$$NPV = -A_0 + \frac{A_1}{(1 + r)} + \frac{A_2}{(1 + r)^2} + \cdots + \frac{A_n}{(1 + r)^n}$$

## 6. MARGINAL FUNCTIONS

### Marginal Revenue

$$MR = \frac{dR}{dx}$$

### Marginal Cost

:

$$MC = \frac{dC}{dx}$$

### Total Cost from Marginal Cost:

$$C = \int M\,C\,dx$$

### Total Revenue from Marginal Revenue:

$$R = \int M\,R\,dx$$

## 7. REPLACEMENT ANALYSIS

### Individual Replacement Cost

$$C = RK$$

where:

$R$ = average number of monthly replacements
$K$ = cost per item.

Number Replaced at the End of Each Month

$$N_i = N_0P_i + N_1P_{i-1} + N_2P_{i-2} + \cdots$$

### Total Group Replacement Cost

$TC$ = Number of group replacement × Group Cost
+ Number of individual replacement × Individual Cost

Then:

$$\text{Average Cost per Month} = \frac{TC}{\text{Number of Months}}$$

## 8. INVENTORY CONTROL

### Economic Order Quantity (EOQ)

$$EOQ = \sqrt{\frac{2cd}{h}}$$

where:
$d$ = annual demand
c = ordering cost per order
$h$ = holding cost per unit per annum

## SOLUTION

## MULTIPLE CHOICE ANSWERS

1. E
2. A
3. B
4. B
5. A
6. A
7. B
8. B
9. D
10. D
11. B
12. A
13. D
14. E
15. B
16. B
17. B
18. A
19. B
20. D
21. C
22. C
23. C
24. A
25. D
26. A
27. D
28. C
29. A
30. C

## MCQ WORKINGS

2. Arrange the data in ascending order:

$$1, 3, 5, 7, 9, 11, 13, 15$$

There are 8observations, so $n = 8$, which is an even number.

For an even number of observations, the median is the average of the two middle observations:

$$\text{Median} = \frac{\frac{n}{2}\text{th observation} + \left(\frac{n}{2}+1\right)\text{th observation}}{2}$$

Therefore,

$$\text{Median} = \frac{4\text{th observation} + 5\text{th observation}}{2}$$

$$= \frac{7+9}{2}$$

$$= 8$$

$$\text{Median} = 8$$

**Answer: A. 8**

3. Range = Upper bound of the last class – Lower bound of the first class (for grouped data)

From the given data, upper bound of the last class = 35

Lower bound of the first class = 5

Therefore,

$$\text{Range} = 35 - 5 = 30$$

**Answer: B. 30**

4. Recall that:

$$\text{Coefficient of Variation (CV)} = \frac{\text{Standard Deviation}}{\text{Mean}} \times 100$$

Working/Calculation Table:

| Class Interval | Frequency ($f$) | Midpoint ($x$) | $fx$ | $x^2$ | $fx^2$ |
|---|---|---|---|---|---|
| 1 – 10 | 5 | 5.5 | 27.5 | 30.25 | 151.25 |
| 11 – 20 | 10 | 15.5 | 155.0 | 240.25 | 2,402.50 |
| 21 – 30 | 15 | 25.5 | 382.5 | 650.25 | 9,753.75 |
| 31 – 40 | 10 | 35.5 | 355.0 | 1,260.25 | 12,602.50 |
| 41 – 50 | 5 | 45.5 | 227.5 | 2,070.25 | 10,351.25 |
| **Total** | **45** | | **1,147.50** | | **35,261.25** |

**Calculate the mean**

$$\bar{x} = \frac{\sum f x}{\sum f}$$

$$\bar{x} = \frac{1147.50}{45}$$

$$\bar{x} = 25.5$$

**Calculate the standard deviation**

Using the shortcut formula,

$$\sigma = \sqrt{\frac{\sum f x^2}{\sum f} - \left(\frac{\sum f x}{\sum f}\right)^2}$$

Therefore,

$$\sigma = \sqrt{\frac{35261.25}{45} - \left(\frac{1147.50}{45}\right)^2}$$

$$= \sqrt{783.5833 - 650.25}$$

$$= \sqrt{133.3333}$$

$$\therefore \sigma = 11.547$$

**Calculate the coefficient of variation**

Using

$$CV = \frac{\sigma}{\bar{x}} \times 100$$

$$CV = \frac{11.547}{25.5} \times 100$$

$$CV = 45.28\% \approx 45.3\%$$

Answer: B. 45.3%.

5. The Pearson correlation coefficient is given by:

$$r = \frac{n\sum x\,y - \sum x \sum y}{\sqrt{[n\sum x^2 - (\sum x)^2][n\sum y^2 - (\sum y)^2]}}$$

Given summary statistics:

$$n = 10,\ \sum x = 50,\ \sum y = 60$$

$$\sum x^2 = 300,\ \sum y^2 = 400,\ \sum x\,y = 320$$

Substituting the given values gives

$$r = \frac{10(320) - (50)(60)}{\sqrt{[10(300) - 50^2][10(400) - 60^2]}}$$

$$= \frac{3200 - 3000}{\sqrt{(3000 - 2500)(4000 - 3600)}}$$

$$= \frac{200}{\sqrt{500(400)}}$$

$$= \frac{200}{447.21}$$

$$r = 0.4472 \approx 0.45$$

$$\therefore r = 0.45$$

Answer: A. 0.45

6. The appropriate measure for comparing the consistency of the suppliers' pricing is the coefficient of variation (CV).

The coefficient of variation is given by

$$CV = \frac{Standard\ Deviation}{Mean} \times 100$$

Calculate the CV for each supplier:

Supplier P:

$$CV_P = \frac{3}{60} \times 100 = 5\%$$

Supplier Q:

$$CV_Q = \frac{5}{50} \times 100 = 10\%$$

Supplier R:

$$CV_R = \frac{4}{55} \times 100 = 7.27\%$$

The supplier with the lowest coefficient of variation has the most consistent pricing.

Therefore, Supplier P, with the lowest CV of 5%, offers the most consistent pricing.

Answer: A. Supplier P

8. The Simple Aggregate Price Index (SAPI) is calculated as:

$$SAPI = \frac{\sum p_1}{\sum p_0} \times 100$$

where:

$p_0$ = Base Year Price

$p_1$ = Current Year Price

From the question:

$$\sum p_0 = 10 + 20 + 30 = 60$$

$$\sum p_1 = 12 + 25 + 35 = 72$$

Therefore,

$$SAPI = \frac{72}{60} \times 100$$

$$SAPI = 120$$

Therefore, the Simple Aggregate Price Index (SAPI) is 120.

**Answer: B. 120**

12. Given:

$$Q_1 = 25, \ \ Q_3 = 40$$

The quartile deviation is given by

$$\text{Quartile Deviation} = \frac{Q_3 - Q_1}{2} = \frac{40 - 25}{2} = \frac{15}{2} = 7.5$$

**Answer: A. 7.5**

13. The discount factor is obtained as

$$\frac{1}{(1 + 0.8)^3} = 0.7938$$

$$\begin{aligned} \therefore \text{Present Value} &= \text{Cash Flow} \times \text{Discount Factor} \\ &= ₦650{,}000 \times 0.7938 \\ &= ₦515{,}970 \end{aligned}$$

Therefore, the corresponding present value is ₦515,970.

**Answer: D. ₦515,970**

14. Given:

$$A = \{3, 2, 1, 4, 8$$
$$B = \{8, 9, 4, 5, 7\}$$

$$U = \{x, : x \text{ is an integer}, 1 \leq x < 10\}$$

That is,

$$U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$$

Then

$$A \cup B = \{1, 2, 3, 4, 5, 7, 8, 9$$

$$(A \cup B)^c = U - (A \cup B)$$

Hence,

$$(A \cup B)^c = \{6\}$$

$$\therefore \ \ n((A \cup B)^c) = 1$$

**Answer: E. 1**

15. Given:

Initial setup cost (fixed cost) = Le1,000,000

Cost of producing one bar soap = Le200

Selling price per bar = Le550

Required profit = at least Le19,900

**Formulate the profit function:**

Let $x$ represent the number of bar soaps produced and sold, then

$$\text{Total Cost} = 1{,}000{,}000 + 200x$$

$$\text{Total Revenue} = 550x$$

Therefore,

$$\text{Profit} = 550x - (1{,}000{,}000 + 200x)$$

$$= 350x - 1{,}000{,}000$$

The required profit is at least Le19,900:

$$350x - 1{,}000{,}000 \geq 19{,}900$$

**Solve the inequality:**

$$350x \geq 1{,}019{,}900$$

$$x \geq \frac{1{,}019{,}900}{350}$$

$$\therefore\ x \geq 2{,}914$$

Therefore, the minimum quantity required to achieve a profit of at least Le19,900, is 2,914 bars.

**Answer: B. 2,914**

17. Given the profit function:

$$P(x) = 500 + 8x - 3x^2$$

where $x$represents the quantity of goods sold in thousands.

Find the first derivative:

$$\frac{dP}{dx} = 8 - 6x$$

For a critical point:

$$\frac{dP}{dx} = 0$$

$$8 - 6x = 0$$

$$x = \frac{4}{3}$$

Find the second derivative:

$$\frac{d^2P}{dx^2} = -6 < 0$$

Since

$$\frac{d^2P}{dx^2} < 0,$$

the critical point $x = \frac{4}{3}$gives a maximum profit.

**Convert to actual quantity**

Since $x$is measured in thousands:

$$x = \frac{4}{3} \times 1000 = 1{,}333.33$$

Thus, the quantity of goods that maximises the profit is approximately $1{,}333$ units.

**Answer: B. 1,333**

18. To obtain the total cost function, we integrate the marginal cost function.

$$TC(x) = \int (3x^2 + 2x)\, dx$$

Integrating term by term:

$$TC(x) = 3\int x^2\, dx + 2\int x\, dx$$

$$TC(x) = 3\left(\frac{x^3}{3}\right) + 2\left(\frac{x^2}{2}\right) + C$$

$$\therefore\ TC(x) = x^3 + x^2 + C$$

where $C$ is the arbitrary constant of integration.

**Answer: A.** $TC(x) = x^3 + x^2 + C$

20. The Economic Order Quantity (EOQ) is given by:

$$EOQ = \sqrt{\frac{2cd}{h}}$$

Substitute the values:

$$EOQ = \sqrt{\frac{2 \times 250 \times 15{,}000}{12}}$$

$$= \sqrt{\frac{7{,}500{,}000}{12}}$$

$$= \sqrt{625{,}000}$$

$$= 790.57$$

$$\therefore EOQ \approx 791 \text{ units}$$

**Answer: A. 791 units**

22. The Net Present Value (NPV) is:

$$NPV = A_0 + \frac{A_1}{(1+r)} + \frac{A_2}{(1+r)^2} + \frac{A_3}{(1+r)^3}$$

Calculate the present values:

$$PV_1 = \frac{3{,}000}{1.10} = 2{,}727.27$$

$$PV_2 = \frac{4{,}000}{(1.10)^2} = 3{,}305.79$$

$$PV_3 = \frac{5{,}000}{(1.10)^3} = 3{,}756.57$$

Calculate NPV:

$$NPV = -10{,}000 + 2{,}727.27 + 3{,}305.79 + 3{,}756.57$$

$$NPV = -10{,}000 + 9{,}789.63$$

$$NPV = -210.37$$

**Answer: C. −₦210.37**

24. Given:

Ordering Cost per unit = Le0.10

Annual demand = 100,000 units

Total Ordering cost = Le 1,000,000

∴ Cost per order = $\text{Le}(0.10 \times 100{,}000) = \text{Le}10{,}000$

Recall that

$$\text{Number of orders} = \frac{\text{Total ordering Cost}}{\text{Cost per oder}}$$

$$\therefore \quad \text{Number of orders} = \frac{1{,}000{,}000}{10{,}000} = 100$$

Answer: A. 100

25. The critical path determines the minimum time required to complete the entire project. Therefore, a delay in any activity on the critical path, assuming no corrective action, will increase the project duration by the same amount.

$$\text{New Project Duration} = 18 + 3$$
$$= 21 \text{ days}$$

Therefore, the resulting overall project duration is 21 days.

Answer: D. 21 days

27. Annual replacement cost for the group= $\frac{\text{GH₵}1{,}200{,}000}{4} = \text{GH₵}300{,}000$

Annual replacement cost per machine= $\frac{\text{GH₵}300{,}000}{50} = \text{GH₵}6{,}000$

Thus, the approximate average annual cost per machine is the sum of the annual replacement cost per machine and annual operating cost per machine.

That is,

$$\text{GH₵}6{,}000 + \text{GH₵}3{,}000 = \text{GH₵}9{,}000$$

Answer: D. GH₵9,000

**ALITER:**

Total replacement cost over 4 years = GH₵1,200,000

Annual group replacement cost = GH₵1,200,000 / 4 = GH₵300,000

Operating costs over 4 years:

50 machines × GH₵3,000 × 4 = GH₵600,000

Total costs over 4 years = GH₵1,200,000 + GH₵600,000 = GH₵1,800,000

Average annual total cost = GH₵1,8,00,000 / 4 = GH₵450,000

Per machine per year = GH₵4,50,000 / 50 = GH₵9,000

29. For the first assignment, the lowest cost in the matrix is 6 (i.e., assign $W_1$ to $P_2$).

| | $P_1$ | $P_2$ | $P_3$ |
|---|---|---|---|
| $W_1$ | ~~8~~ | ~~6~~ | ~~9~~ |
| $W_2$ | 9 | 7 | 8 |
| $W_3$ | 10 | 9 | 7 |

Following the first assignment ($W_1$ to $P_2$), the remaining matrix is:

| | $P_1$ | $P_3$ |
|---|---|---|
| $W_2$ | 9 | 8 |
| W3 | 10 | 7 |

The least remaining cost is 7.

This corresponds to $W_3 \rightarrow P_3$.

Thus, the second assignment is $W_3 \rightarrow P_3$ (assign $W_3$ to $P_3$)

**Answer: A.** $W_1$ to $P_2$ and $W_3$ to $P_3$

**Examiner's comment**

All the 30 questions in that section are fairly spread throughout the three parts of the current syllabus. Candidates are expected to answer all these 30 questions.

It is to be noted that questions 4, 24 and 29 attracted bonus marks for all the candidates. This is because of the identified typographical errors in the working of the questions.

On the average, the candidates performed fairly well to the extent that about 78% of the candidates scored between 18 and 28 out of 30 marks.

The lowest and highest marks obtained by candidates are 2 and 28 respectively.

## SHORT ANSWER SOLUTIONS

1. Population
2. 12
3. 0.88
4. Least squares
5. 180, 20 (in that order)
6. 150
7. 0.8 or 80%
8. Test statistic
9. ₦1,740.70
10. ₦3,152.50
11. First
12. ₦300,000
13. maximize
14. Objective function
15. Carrying cost or holding cost
16. Independent float
17. Individual replacement policy
18. Penalty
19. Le250
20. ₦16,000

## SAQ WORKINGS

2. The mode is 12 because it appears most frequently compared to other figures.

3. **Calculate the mean**

$$\bar{x} = \frac{\sum x}{n} = \frac{3 + 5 + 4 + 6 + 5}{5} = \frac{23}{5} = 4.6$$

**Calculate the absolute deviations from the mean**

| $x$ | $d_i = x_i - \bar{x}$ | $\lvert\bar{d}_i\rvert = \lvert x_i - \bar{x}\rvert$ |
|---|---|---|
| 3 | -1.6 | 1.6 |
| 5 | 0.4 | 0.4 |
| 4 | -0.6 | 0 |
| 6 | 1.4 | 1.4 |
| 5 | 0.4 | 0.4 |
| Total | | 4.4 |

**Calculate the mean deviation**

$$\text{Mean Deviation} = \frac{\sum | x - \bar{x} |}{n} = \frac{4.4}{5} = 0.88$$

**Answer: 0.88**

**ALITER:**

The mean is

$$\bar{x} = \frac{3+4+5+5+6}{5} = \frac{23}{5} = 4.6$$

The mean deviation is

$$MD = \frac{|3-4.6|+|4-4.6|+|5-4.6|+|5-4.6|+|6-4.6|}{5}$$

$$MD = \frac{1.6+0.6+0.4+0.4+1.4}{5} = \frac{4.4}{5} = 0.88$$

5. Given:

$$\sum x = 6,\ \sum y = 660,\ \sum xy = 1360,\ \sum x^2 = 14$$

Number of observations: $n = 3$

Using:

$$b = \frac{n\sum xy - \sum x \sum y}{n\sum x^2 - (\sum x)^2}$$

$$b = \frac{3(1360) - (6)(660)}{3(14) - 6^2} = \frac{4080 - 3960}{42 - 36} = \frac{120}{6} = 20$$

$$a = \frac{\sum y - b\sum x}{n} = \frac{660 - 20(6)}{3} = \frac{540}{3} = 180$$

Therefore, $a = 180,\ b = 20.$

6. The Laspeyres' Price Index is given by

$$I_L = \frac{\sum p_1 q_0}{\sum p_0 q_0} \times 100$$

Where:

$p_0 = 2$ (Base year price)

$p_1 = 3$(Current year price)

$q_0 = 50$(Base year quantity)

Since there is only one product, then

$$I_L = \frac{p_1 q_0}{p_0 q_0} \times 100 = \frac{3 \times 50}{2 \times 50} \times 100 = \frac{150}{100} \times 100 = 150$$

7. Let:

$M$= event that a student passes Mathematics

$S$= event that a student passes Science

Given:

$$P(M) = 0.60,\ P(S) = 0.50,\ P(M \cap S) = 0.30$$

We need the probability that a student passes either Mathematics or Science:

$$P(M \cup S) = P(M) + P(S) - P(M \cap S)$$

Substitute the known values:

$$P(M \cup S) = 0.60 + 0.50 - 0.30$$
$$= 0.80$$

$$\therefore\ P(M \cup S) = 0.8 \text{ or } 80\%$$

**Answer: 0.80, 0.8 or 80%**

9. Given:

$$R(t) = 50e^{0.03t}$$

The rate of change of revenue is obtained by differentiating $R(t)$with respect to $t$:

$$\text{i. e.,} \qquad \frac{dR}{dt} = 50(0.03)e^{0.03t} = 1.5e^{0.03t}$$

At $t = 5$:

$$\frac{dR}{dt} = 1.5e^{0.03(5)} = 1.5e^{0.15} = 1.5 \times 1.1618 = 1.7427$$

Since $R(t)$ is measured in thousands of naira, the rate of change is

$$1.7427 \times ₦1{,}000 = ₦1{,}742.70$$

**Answer: ₦1,742.70 per year**

10. This is an ordinary annuity because ₦1,000 is deposited at the end of each year.

The future value of an ordinary annuity is given as

$$S = A\left[\frac{(1+r)^n - 1}{r}\right],$$

Where $A = ₦1{,}000,\ r = 0.05,\ n = 3$

Hence,

$$S = 1000\left[\frac{(1.05)^3 - 1}{0.05}\right] = 1000\left[\frac{1.157625 - 1}{0.05}\right] = 1000(3.1525) = 3152.50$$

$$\therefore\ S = ₦3{,}152.50$$

**Answer: ₦3,152.50**

12. Given the total revenue function:

$$R(q) = 600q - 3q^2$$

The marginal revenue (MR) is the first derivative of total revenue with respect to $q$, that is,

$$MR = \frac{dR}{dq}$$

Therefore,

$$\frac{dR}{dq} = 600 - 6q$$

At $q = 50$,

$$MR = 600 - 6(50)$$
$$= 600 - 300$$
$$= 300$$

Since revenue is given in thousands of naira, the marginal revenue is ₦300,000 per unit.

**Answer: ₦300,000**

19. Cost from Supplier X: 50 × Le2 = Le100

Cost from Supplier Y: 50 × Le3= Le150

Total Transportation cost =Le100 + Le150 = Le250

20. The sales volume is randomly distributed between 120 and 200 units.

Assuming all values in this range are equally likely, the expected sales volume is the midpoint:

$$E(Q) = \frac{120 + 200}{2} = 160 \text{ units}$$

Given the average profit per unit is ₦100:

$$\text{Expected Profit} = 160 \times ₦100$$
$$= ₦16,000$$

**Answer: ₦16,000**

**Examiner's comment**

All the 20 questions in this section are mixture of recall definitions and some calculation-prone questions. Candidates' performance was a little bit below the average. About 68.6% of the candidates obtained marks between 9 and 17 out of 20 marks.

The lowest and highest marks recorded are 3 and 17 respectively.

## SECTION B

## SOLUTION 1

Given Data:

| Item | Quantity in Year 1 | Price in Year 1 ₦ | Quantity in Year 2 | Price in Year 2 ₦ |
|---|---|---|---|---|
| P | 6 | 8,000 | 8 | 5,000 |
| Q | 10 | 2,000 | 16 | 4,000 |
| R | 7 | 5,000 | 12 | 6,000 |
| X | 8 | 10,000 | 10 | 12,000 |
| Y | 15 | 4,000 | 18 | 5,000 |

**Working/Calculation Table:**

| Item | $q_0$ | $p_0$(₦) | $q_1$ | $p_1$(₦) | $p_0q_0$ | $p_1q_0$ | $p_0q_1$ | $p_1q_1$ |
|---|---|---|---|---|---|---|---|---|
| P | 6 | 8,000 | 8 | 5,000 | 48,000 | 30,000 | 64,000 | 40,000 |
| Q | 10 | 2,000 | 16 | 4,000 | 20,000 | 40,000 | 32,000 | 64,000 |
| R | 7 | 5,000 | 12 | 6,000 | 35,000 | 42,000 | 60,000 | 72,000 |
| X | 8 | 10,000 | 10 | 12,000 | 80,000 | 96,000 | 100,000 | 120,000 |
| Y | 15 | 4,000 | 18 | 5,000 | 60,000 | 75,000 | 72,000 | 90,000 |
| **Total** | | | | | **243,000** | **283,000** | **328,000** | **386,000** |

(a) **Laspeyres' Price Index**

The Laspeyres' Price Index uses base-year quantities as weights.

Formula:

$$I_L = \frac{\sum p_1 q_0}{\sum p_0 q_0} \times 100$$

From the table:

$$\sum p_1 q_0 = 283{,}000$$

and

$$\sum p_0 q_0 = 243{,}000$$

Therefore,

$$I_L = \frac{283{,}000}{243{,}000} \times 100$$

$$I_L = 116.46$$

$$\therefore \text{Laspeyres' Price Index} = 116.46$$

**Interpretation**

The Laspeyres' PriceIndex of 116.46means that, using Year 1 quantities as weights, the overall price level in Year 2 was approximately 16.46% higher than in Year 1.

(b) **Paasche Price Index**

The Paasche's Price Index uses current-year quantities as weights.
Formula:

$$I_P = \frac{\sum p_1 q_1}{\sum p_0 q_1} \times 100$$

From the table:

$$\sum p_1 q_1 = 386{,}000$$

and

$$\sum p_0 q_1 = 328{,}000$$

Therefore,

$$I_P = \frac{386{,}000}{328{,}000} \times 100$$

$$I_P = 117.68$$

$$\therefore \text{Paasche Price Index} = 117.68$$

**Interpretation**

The Paasche's PriceIndex of 117.68 indicates that, using Year 2 quantities as weights, the overall price level increased by approximately 17.68% relative to Year 1.

(c) **Fisher's Ideal Price Index**

The Fisher's Ideal Price Index is the geometric mean of the Laspeyres and Paasche Price indices.
Formula:

$$I_F = \sqrt{I_L \times I_P}$$

Substituting the values obtained into the formula gives:

$$I_F = \sqrt{116.46 \times 117.68}$$

$$I_F = \sqrt{13705.44}$$

$$I_F \approx 117.07$$

$$\therefore \text{ Fisher's Ideal Price Index} = 117.07$$

**Interpretation**

The Fisher's Ideal Price Index of 117.07 indicates that the general price level of the basket in Year 2 was approximately 17.07% higher than in Year 1.

**ALITER FOR (c)**

$$I_F = \sqrt{\frac{\sum p_1 q_0}{\sum p_0 q_0} \times \frac{\sum p_1 q_1}{\sum p_0 q_1}} \times \frac{100}{1}$$

$$I_F = \sqrt{\frac{283{,}000}{243{,}000} \times \frac{386{,}000}{328{,}000}} \times \frac{100}{1}$$

$$I_F = \sqrt{1.1646 \times 1.1768} \times 100$$

$$I_F = \sqrt{1.3705} \times 100$$

$$\therefore\ I_F = 1.17068 \times 100 \approx 117.07$$

**Examiner's comment**

Tests the candidate's knowledge and application of Index Numbers, which is covered under the Statistics component of the QA curriculum. In particular, the question examines the calculation of the Laspeyres, Paasche and Fisher Price Indices. The question requires candidates to distinguish correctly between base-year and current-year quantities and prices and to apply the appropriate weights in calculating each index.

76% of the candidates attempted the question with an average score of 8.5 out of 12.5 maximum marks.

Generally, the candidates did fairly well in this question. The attached formulae assisted them fairly well. The only pitfall identified was the avoidable arithmetical errors and forgetting to multiply their answers by 100 in order to express the answers in percentages.

**SOLUTION 2**

Given:

| Month | Sales (Cartons) |
|---|---|
| 1 | 150 |
| 2 | 160 |
| 3 | 155 |
| 4 | 170 |
| 5 | 180 |
| 6 | 190 |
| 7 | 185 |
| 8 | 200 |
| 9 | 210 |
| 10 | 220 |

(a) Trend Line using the Semi-Averages Method

Since there are 10 observations, divide the data into two equal groups.

**Divide the data into two equal groups:**

| First Group (First 5 Months) | |
|---|---|
| Months $(x)$ | Sales $(y)$ |
| 1 | 150 |
| 2 | 160 |
| 3 | 155 |
| 4 | 170 |
| 5 | 180 |
| Total | 815 |

| Second Group (Last 5 Months) | |
|---|---|
| Months $(x)$ | Sales $(y)$ |
| 6 | 190 |
| 7 | 185 |
| 8 | 200 |
| 9 | 210 |
| 10 | 220 |
| Total | 1,005 |

**Calculate the two semi-averages**

**First semi-average:**

$$\bar{y}_1 = \frac{815}{5} = 163$$

The mid-point of Months 1–5 is obtained as

$$x_1 = \frac{1+5}{2} = 3$$

Therefore, the first semi-average point is$(3, 163)$.

**Second semi-average:**

$$\bar{y}_2 = \frac{1{,}005}{5} = 201$$

The mid-point of Months 6–10 is obtained as

$$x_2 = \frac{6+10}{2} = 8$$

Therefore, the second semi-average point is $(8, 201)$..

The trend line passes through the two points $(3, 163)$ and $(8, 201)$.

The slope of the trend line is given as

$$b = \frac{y_2 - y_1}{x_2 - x_1}$$

in which

$$b = \frac{201 - 163}{8 - 3} = \frac{38}{5} = 7.6$$

Using the equation

$$\bar{y} = a + bx$$

Substitute $(3, 163)$ into the equation, gives

$$163 = a + 7.6(3)$$
$$\therefore\ a = 163 - 22.8 = 140.2$$

Hence, the trend line equation is obtained as

$$\hat{y} = 140.2 + 7.6x$$

where $x$represents the month and $\hat{y}$represents the trend value of sales.

(b) **Trend Line using the 3-Month Moving Average Method**

**Calculate the 3-month moving averages**

For a 3-month moving average:

$$MA_t = \frac{\text{Sum of sales for three consecutive months}}{3}$$

Since the moving-average period is odd (3 months), each moving average is assigned to the middle month of the three-month period.

Calculation of the 3-Month Moving Averages:

**Moving Average Calculation Table:**

| Month | Sales | 3-Month Moving Total | 3-Month Moving Average |
|---|---|---|---|
| 1 | 150 | - | — |
| 2 | 160 | 150+160+155=465 | 465/3=155 |
| 3 | 155 | 160+155+170=485 | 485/3=161.67 |
| 4 | 170 | 155+170+180=505 | 505/3=168.33 |
| 5 | 180 | 170+180+190=540 | 540/3=180.00 |
| 6 | 190 | 180+190+185=555 | 555/3=185.00 |
| 7 | 185 | 190+185+200=575 | 575/3=191.67 |
| 8 | 200 | 185+200+210=595 | 595/3=198.33 |
| 9 | 210 | 200+210+220=630 | 630/3=210.00 |
| 10 | 220 | - | — |

**Summary:**

| Month | Sales | Trend (3-Month Moving Average) |
|---|---|---|
| 1 | 150 | — |
| 2 | 160 | 155.00 |
| 3 | 155 | 161.67 |
| 4 | 170 | 168.33 |
| 5 | 180 | 180.00 |
| 6 | 190 | 185.00 |
| 7 | 185 | 191.67 |
| 8 | 200 | 198.33 |
| 9 | 210 | 210.00 |
| 10 | 220 | — |

(c) **Trend Line using the Least Squares Method**

The trend equation is:

$$\hat{Y} = a + bX$$

Since there are 10 observations, use coded values of $X$centered around zero:

$$X = -9, -7, -5, -3, -1, 1, 3, 5, 7, 9$$

This makes:

$$\sum X = 0$$

**Construct the working/calculation table:**

| Month | $Y$ | $X$ | $X^2$ | $XY$ |
|---|---|---|---|---|
| 1 | 150 | -9 | 81 | -1,350 |
| 2 | 160 | -7 | 49 | -1,120 |
| 3 | 155 | -5 | 25 | -775 |
| 4 | 170 | -3 | 9 | -510 |
| 5 | 180 | -1 | 1 | -180 |
| 6 | 190 | 1 | 1 | 190 |
| 7 | 185 | 3 | 9 | 555 |
| 8 | 200 | 5 | 25 | 1,000 |
| 9 | 210 | 7 | 49 | 1,470 |
| 10 | 220 | 9 | 81 | 1,980 |
| **Total** | **1,820** | **0** | **330** | **1,260** |

**Calculate $a$:**

Since:

$$\sum X = 0$$

$$a = \frac{\sum Y}{n}$$

Therefore:

$$a = \frac{1820}{10} = 182$$

**Calculate $b$:**

$$b = \frac{\sum XY}{\sum X^2}$$

$$b = \frac{1260}{330} = 3.8182$$

Therefore, the leastsquares trend equation is

$$\hat{Y} = 182 + 3.8182X$$

where

$$X = -9, -7, -5, -3, -1, 1, 3, 5, 7, 9$$

correspond to Months 1–10 respectively.

**Important note**

If the equation is required in terms of the actual month number $t = 1, 2, \ldots, 10$rather than the coded $X$, then,

$$X = 2t - 11$$

Hence,

$$\hat{Y} = 182 + 3.8182(2t - 11)$$

$$\hat{Y} = 182 + 7.6364t - 42.0002$$

$$\therefore \hat{Y} \approx 140 + 7.64t$$

**ALTERNATIVE SOLUTION**

The trend equation is

$$y = a + bt$$

where

$$t = x_i - x_m$$

and $x_m$ is the median of the $(x)$ values.

**Determine the median of $x$values**

The $x$-values are 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

$$\therefore\ x_m = \frac{5+6}{2} = 5.5$$

Hence, $t = x_i - 5.5$.

**Construct the working/calculation table**

| $x$ | $y$ | $t = x - 5.5$ | $ty$ | $t^2$ |
|---|---|---|---|---|
| 1 | 150 | -4.5 | -675 | 20.25 |
| 2 | 160 | -3.5 | -560 | 12.25 |
| 3 | 155 | -2.5 | -387.5 | 6.25 |
| 4 | 170 | -1.5 | -255 | 2.25 |
| 5 | 180 | -0.5 | -90 | 0.25 |
| 6 | 190 | 0.5 | 95 | 0.25 |
| 7 | 185 | 1.5 | 277.5 | 2.25 |
| 8 | 200 | 2.5 | 500 | 6.25 |
| 9 | 210 | 3.5 | 735 | 12.25 |
| 10 | 220 | 4.5 | 990 | 20.25 |
| **Total** | **1,820** | **0** | **630** | **82.50** |

**Calculate the value of $b$**

Using

$$b = \frac{\sum ty}{\sum t^2},$$

$$\therefore\ b = \frac{630}{82.50} = 7.6364$$

**Calculate the value of $a$:**

Since $y = a + bt$ and $\sum t = 0$, the intercept $a = \bar{y}$.

Therefore,

$$\bar{y} = \frac{\sum y}{\sum n} = \frac{1820}{10} = 182$$

$$a = \bar{y} = 182$$

Substituting $a = 182$ and $b = 7.6364$ into the Least Squares trend equation, gives

$$y = 182 + 7.6364t$$

where

$$t = x - 5.5$$

Therefore, the trend equation in terms of $x$ is:

$$y = 182 + 7.6364(x - 5.5)$$
$$y = 182 + 7.6364x - 42$$
$$\therefore\ y = 140 + 7.6364x$$

Hence, the Least Squares trend equation is:

$$y = 140 + 7.64x$$

## Examiner's comment

Examines Time Series Analysis, which is another important area of the Statistics component of the QA curriculum. The question focuses specifically on the estimation of trend using the semi-averages, moving averages and least squares methods. Candidates are expected to demonstrate their ability to work with chronological data and obtain a measure of the underlying movement in the series. Thus, the question tests both computational competence and the candidate's understanding of different approaches to measuring trend. The question particularly tests the candidate's ability to apply statistical methods for identifying and estimating the underlying trend in a time series.

More than 80% of the candidates attempted the question with an average score of 7 out 12.5. The pitfall identified was in the area of computational ability of some of the candidates. Some of them were careless in their calculations.

Candidates are advised to study the ICAN Study Text very well and to practice lot of questions.

## SOLUTION 3

We are given the relationship between hours of study $X$ and examination scores $Y$ for ten Quantitative Analysis (QA) candidates.

The least-squares regression line of $Y$ on $X$ is:

$$\hat{Y} = a + bX$$

Given Data:

| Candidate | Hours of Study ($X$) | Examination Score ($Y$) |
|---|---|---|
| 1 | 2 | 55 |
| 2 | 3 | 58 |
| 3 | 4 | 62 |
| 4 | 5 | 65 |
| 5 | 6 | 68 |
| 6 | 7 | 70 |
| 7 | 8 | 74 |
| 8 | 9 | 77 |
| 9 | 10 | 80 |
| 10 | 11 | 82 |

**Working/Calculation Table:**

| Candidate | $X$ | $Y$ | $X^2$ | $XY$ |
|---|---|---|---|---|
| 1 | 2 | 55 | 4 | 110 |
| 2 | 3 | 58 | 9 | 174 |
| 3 | 4 | 62 | 16 | 248 |
| 4 | 5 | 65 | 25 | 325 |
| 5 | 6 | 68 | 36 | 408 |
| 6 | 7 | 70 | 49 | 490 |
| 7 | 8 | 74 | 64 | 592 |
| 8 | 9 | 77 | 81 | 693 |
| 9 | 10 | 80 | 100 | 800 |
| 10 | 11 | 82 | 121 | 902 |
| **Total** | **65** | **691** | **505** | **4,742** |

Thus:

$$n = 10,\ \sum X = 65,\ \sum Y = 691$$

$$\sum X^2 = 505,\ \sum XY = 4742$$

(a) **Least Squares Regression Line of $Y$ on $X$**

The regression equation is:

$$\hat{Y} = a + bX$$

**Calculate the regression coefficient** $b$**:**

Use:

$$b = \frac{n\sum XY - \sum X \sum Y}{n\sum X^2 - (\sum X)^2}$$

Substituting:

$$b = \frac{10(4742) - (65)(691)}{10(505) - (65)^2}$$

$$b = \frac{47{,}420 - 44{,}915}{5{,}050 - 4{,}225}$$

$$b = \frac{2{,}505}{825}$$

$$b = 3.04$$

Therefore, $b \approx 3.04$

**Calculate the regression constant** $a$**:**

Use:

$$a = \frac{\sum Y - b\sum X}{n}$$

$$\therefore \quad a = \frac{691 - (3.04)(65)}{10}$$

$$a = \frac{691 - 197.6}{10}$$

$$a = 49.34$$

Therefore, $a \approx 49.34$

Hence, the least squares regression equation is:

$$\hat{Y} = 49.34 + 3.04X$$

(b) **Interpretation of** $a$and $b$

**Regression constant/intercept** $a = 49.34$

The intercept represents the estimated examination score when the number of hours of study is zero.

Thus, $a = 49.34$ means that the model estimates a score of approximately 49.34 **marks** for a student who studies for zero hours.

This is a mathematical interpretation of the fitted model; it does not necessarily imply that a student who studies zero hours would actually obtain 49.34 marks.

**Regression coefficient/slope** $b = 3.04$

The slope indicates that for every additional hour of study, the predicted examination score increases by approximately $3.04$ marks on average, according to the fitted regression model.

(c) **Prediction for 7.5 Hours of Study**

The regression equation is:

$$\hat{Y} = 49.34 + 3.04X$$

For $X = 7.5$:

$$\begin{aligned}\hat{Y} &= 49.34 + 3.04(7.5) \\ &= 49.34 + 22.8 \\ &= 72.14\end{aligned}$$

Therefore, $\hat{Y} \approx 72.14$

Predicted examination score of a student who studies for 7.5 hours = 72.14 marks

**Examiner's comment**

Tests Regression Analysis, a topic under the Statistics component of the QA curriculum. The curriculum requires candidates to fit a simple linear regression model, use the least squares method, interpret the regression constant and coefficient, andto make estimates or forecasts using the fitted regression line. The question, therefore, provides a comprehensive test of these skills. It tests the candidate's ability to analyse the relationship between two variables, fit an appropriate regression model, interpret the resulting parameters and use the model for prediction.

More than 72% of the candidates attempted the question with an average score of 8 out of 12.5. Some candidates substituted wrongly into the relevant formulae.

Most of the candidates successfully handled raw mathematical components such as $\sum X^2$ *and* $\sum XY$ though small mathematical signs tripped up weaker scripts.

**SOLUTION 4**

Let:

$A$= set of customers who like Product A

$B$= set customers who like Product B

$C$= set customers who like Product C

Given:

$$n(U) = 200$$

$n(A) = 120,\ n(B) = 90,\ n(C) = 80$

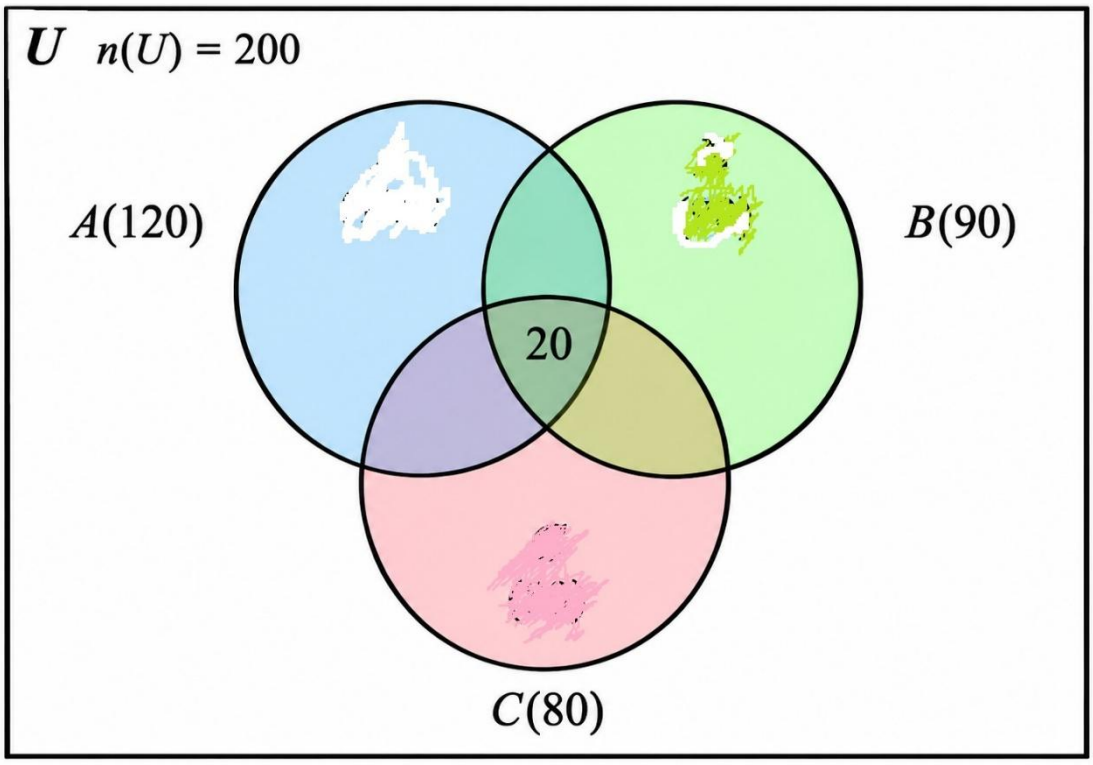
$n(A \cap B) = 50,\ n(A \cap C) = 40,\ n(B \cap C) = 30$

$n(A \cap B \cap C) = 20$

**Note:** The numbers for $A \cap B$, $A \cap C$, and $B \cap C$include the 20 customers who like all three products.

(a) **Euler-Venn Diagram**

**Euler-Venn Diagram for the Customers' preferences**




(b) Number of Customers Who Like Exactly One Product:

$$n(A \cap B)\ only = 50 - 20 = 30$$

$$n(A \cap C)\ only = 40 - 20 = 20$$

$$n(B \cap C)\ only = 30 - 20 = 10$$

Now determine those who like only one product:

$$n(A)\ only = 120 - (30 + 20 + 20) = 50$$

$$n(B)\ only = 90 - (30 + 10 + 20 = 30$$

$$n(C)\ only = 80 - (20 + 10 + 20) = 30$$

Exactly one product means customers who are in A only, B only or C only:

Therefore,

$$n(A)\ only + n(B)\ only + n(C)\ only = 50 + 30 + 30 = 110$$

Hence, 110 customers like exactly one product.

(c) **Customers Who Do Not Like Any of the Three Products**

First, find the number who like, at least, one product.

Using the inclusion-exclusion formula:

$$n(A \cup B \cup C) = n(A) + n(B) + n(C) - n(A \cap B) - n(A \cap C) - n(B \cap C) + n(A \cap B \cap C)$$

Substitute:

$$\begin{aligned} n(A \cup B \cup C) &= 120 + 90 + 80 - 50 - 40 - 30 + 20 \\ &= 290 - 120 + 20 \\ &= 190 \end{aligned}$$

Therefore, number of customers who do not like any of the three products is:

$$\begin{aligned} n(U) - n(A \cup B \cup C) &= 200 - 190 \\ &= 10 \end{aligned}$$

**Examiner's comment**

Is drawn from Set Theory as Applied to Business, which is covered under the Business Mathematics component of the QA curriculum. The question tests the candidate's ability to represent information involving three sets diagrammatically and subsequently use the diagram to determine the number of customers belonging to particular categories. In particular, candidates are required to determine the number who like exactly one product and the number who do not like any of the products. The question, therefore, tests the practical application of set operations, intersections, unions and complements rather than merely asking candidates to state definitions.

Many of the candidates showed interest in this question. More than 87% of the candidates attempted the question with about 65% of them hitting the 7-mark threshold.

The pitfall observed was that some candidates failed to exclude nested overlapping values when estimating numbers of customers who preferred exactly one product.

Also inability to draw the required Euler-Venn diagram contributed to the pitfall of the candidates in answering the question.

**SOLUTION 5**

Let:

$x$ = number of units of Product P produced

$y$ = number of units of Product Q produced

Profit per unit:

Profit per unit for Product P = GH₵40

Profit per unit for Product Q = GH₵30

(a) **Formulate the Linear Programming Model**

**Objective Function**

The total profit is:

$$Z = 40x + 30y$$

Therefore, the objective is to:

$$\text{Maximise } Z = 40x + 30y$$

Subject to the resource constraints

**Machine A:**

Product P requires 2 hours and Q requires 1 hour. Since a maximum of 100 hours is available, then

$$2x + y \leq 100$$

**Machine B:**

Product P requires 1 hour and Q requires 2 hours. Since a maximum of 80 hours is available:

$$x + 2y \leq 80$$

Also:

$$x \geq 0,\ y \geq 0$$

Therefore, the complete LP model is:

$$\begin{aligned} \text{Maximise } Z &= 40x + 30y \\ \text{subject to: } 2x + y &\leq 100 \\ x + 2y &\leq 80 \\ x, y &\geq 0 \end{aligned}$$

(b) **Optimal Solution Using the Graphical Method**

We first obtain the intercepts of the two constraint lines.

**Line 1**

$$2x + y = 100$$

When $x = 0$, then

$$2(0) + y = 100$$
$$y = 100$$

Therefore, the $y$-intercept is$(0, 100)$.

When $y = 0$, then

$$2x + 0 = 100$$
$$2x = 100$$
$$x = 50$$

Therefore, the $x$-intercept is$(50, 0)$.

Thus, the intercepts are $(0, 100),\ (50, 0)$.

**Line 2**

$$x + 2y = 80$$

When $x = 0$, then

$$0 + 2y = 80$$
$$\therefore\ y = 40$$

Therefore, the $y$-intercept is$(0, 40)$.

When $y = 0$, then

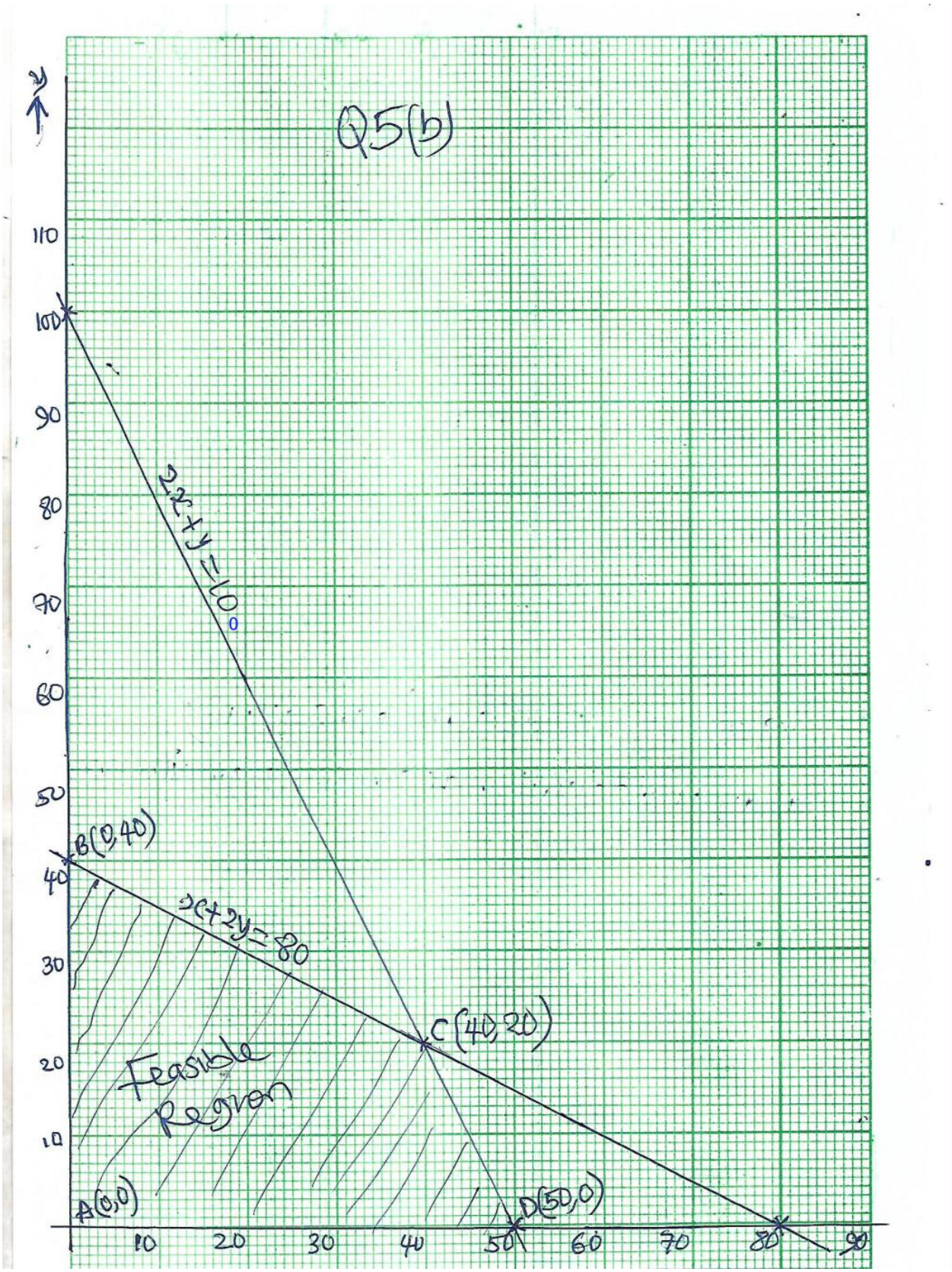
$$x + 2(0) = 80$$
$$\therefore\ x = 80$$

Therefore, the $x$-intercept is:$(80, 0)$

Thus, the intercepts are $(0, 40),\ (80, 0)$.

Next, draw the lines representing the equations on the same axes as shown in the figure below. Also, identify the region where all the constraints are simultaneously satisfied. This is called the feasible region.

The feasible region is bounded by these constraints and the non-negativity conditions.


Q5(b)
y
110
100
90
80
70
60
50
40
30
20
10
2x+y=100
B(0,40)
x+2y=80
C(40,20)
Feasible Region
A(0,0)
D(50,0)
10
20
30
40
50
60
70
80
90

From the graph, the coordinates of the corner points of the boundary of the feasible region are:

$$A(0,0), \quad B(0,40), \quad C(40,20), \quad D(50,0)$$

Next, the value of the objective function for each of the points is calculated by substituting each of the coordinates in the objective function as follows:

| **Coordinates of Corner Point** $(x, y)$ | **Value of** $Z = 40x + 30y$ **(GH₵)** |
|---|---|
| $A(0,0)$ | **GH₵0** |
| $B(0,40)$ | **GH₵1,200** |
| $C(40,20)$ | **GH₵2,200** |
| $D(50,0)$ | **GH₵2,000** |

The maximum profit (**GH₵2,200**) occurs at:

$$x = 40, \; y = 20$$

Therefore, the factory should produce $40$ units of **P** and $20$ units of **Q**.

(c) **Shadow Prices of Machine A and Machine B**

Check the resource usage.

**Machine A**

$$2(40) + 20 = 100$$

Thus, **100** hours used.

Since **100** hours are available, Machine A is fully utilised.

**Machine B**

$$40 + 2(20) = 80$$

Thus: **80** hours used.

Since **80** hours are available, Machine B is also fully utilised.

At this point ($x = 40, \; y = 20$), both Machine A and Machine B are fully utilized.

Thus, both constraints are binding.

The shadow price represents the increase in maximum profit resulting from one additional unit of the corresponding resource, within the relevant range.

The original linear programming problem is:

$$\text{Maximise } Z = 40x + 30y$$

Subject to:

$$2x + y \leq 100 \text{ (Machine A)}$$
$$x + 2y \leq 80 \text{ (Machine B)}$$

At the optimal solution:

$$x = 40,\ y = 20$$

Therefore, the maximum profit (as obtained before) is:

$$Z = 40(40) + 30(20) = GH₵2{,}200.$$

### Shadow Price of Machine A

To determine the shadow price of Machine A, increase its available capacity by **one hour**, from 100 to 101 hours, while keeping Machine B unchanged.

Thus:

$$2x + y = 101$$
$$x + 2y = 80$$

Solving simultaneously:

From the second equation,

$$x = 80 - 2y.$$

Substitute into the first equation,

$$2(80 - 2y) + y = 101$$
$$160 - 4y + y = 101$$
$$-3y = -59$$

$$y = \frac{59}{3} = 19.67$$

Hence,

$$x = 80 - 2\left(\frac{59}{3}\right) = \frac{122}{3} = 40.67.$$

$$x = 40.67,\ y = 19.67.$$

New maximum profit:

$$Z = 40(40.67) + 30(19.67)$$
$$= GH₵2{,}216.90.$$

Therefore,

$$\text{Shadow Price of Machine A} = GH₵2{,}216.90 - GH₵2{,}200$$

$$= GH₵16.90 \text{ per hour}$$

**Shadow Price of Machine B**

Similarly, increase the available capacity of Machine B by one hour, from 80 to 81 hours, while keeping Machine A unchanged.

Thus:

$$2x + y = 100$$
$$x + 2y = 81$$

Solving simultaneously:

From the first equation,

$$y = 100 - 2x.$$

Substitute into the second equation,

$$x + 2(100 - 2x) = 81$$
$$x + 200 - 4x = 81$$
$$-3x = -119$$
$$x = \frac{119}{3} = 39.67.$$

Therefore,

$$y = 100 - 2\left(\frac{119}{3}\right) = \frac{62}{3} = 20.67.$$

$$x = 39.67,\ y = 20.67.$$

New maximum profit:

$$Z = 40(39.67) + 30(20.67)$$

$$= GH₵2{,}206.90.$$

Therefore,

$$\text{Shadow Price of Machine B} = GH₵2{,}206.90 - GH₵2{,}200$$
$$= GH₵6.90 \text{ per hour}$$

**Interpretation:** An additional hour of Machine A would increase the maximum profit by GH₵16.90, while an additional hour of Machine B would increase the maximum profit by GH₵6.90, within the applicable range.

## Examiner's comment

Tests Linear Programming, a major topic in the Operations Research section of the QA curriculum. The question requires candidates, first to formulate a linear programming problem, then obtain the optimal solution graphically and finally determine the shadow prices of the scarce resources. The formulation component tests whether candidates can translate a practical production situation into decision variables, an objective function and appropriate constraints. The graphical component tests their ability to identify the feasible region, determine the relevant corner points and select the optimal solution. The final component tests their understanding of shadow prices and their significance in the allocation of scarce resources. Thus, the question tests the candidate's ability to apply Operations Research techniques to resource allocation, optimisation and managerial decision-making.

Many of the candidates did not like this question as less than 40% of them attempted the question with about 30% of them scoring marks in excess of 7.

Candidates are strongly advised to study the relevant texts such as the INSIGHT and the ICAN Study Text.

Some of the candidates consistently struggled with algebraic simultaneous conversions, interpreting shadow price profit threshold or setting up boundary bounds.

## SOLUTION 6

Given

Number of resistors in use: $N_0 = 536$

Cost of replacing one resistor as part of a group replacement (group replacement cost per resistor): $C_g = ₦10$

Cost of replacing one resistor individually (individual replacement cost per resistor): $C_i = ₦40$

The failure rates are:

| Month | Failure rate (%) |
|---|---|
| 1 | 10 |
| 2 | 30 |
| 3 | 35 |
| 4 | 20 |
| 5 | 5 |
| Total | 100 |

**Convert Failure Rates to Probabilities:**

| Month | Failure rate (%) | Failure Probability ($P_i$) |
|---|---|---|
| 1 | 10 | 0.10 |
| 2 | 30 | 0.30 |
| 3 | 35 | 0.35 |
| 4 | 20 | 0.20 |
| 5 | 5 | 0.05 |
| Total | 100 | 1.00 |

**Calculate the Number of Individual Replacements Each Month:**

Let:

$$N_0 = 536$$

$$P_1 = 0.10,\ P_2 = 0.30,\ P_3 = 0.35,\ P_4 = 0.05,\ P_5 = 0.20$$

**Number of replacements at the end of 1st month:**

$$N_1 = N_0P_1 = 536(0.10) = 53.6 \approx 54$$

**Number of replacements at the end of 2nd month:**

The failures in Month 2 come from:

- the original 536 resistors, and
- the resistors replaced individually in Month 1..

Therefore,

$$\begin{aligned} N_2 &= N_0P_2 + N_1P_1 \\ &= 536(0.30) + 54(0.10) \\ &= 160.8 + 5.4 = 166.2 \approx 166 \end{aligned}$$

Therefore, $N_2 = 166$

**Number of replacements at the end of 3rd month:**

$$\begin{aligned} N_3 &= N_0P_3 + N_1P_2 + N_2P_1 \\ &= 536(0.35) + 54(0.30) + 166(0.10) \\ &= 187.6 + 16.2 + 16.6 \\ &= 220.4 \approx 220 \end{aligned}$$

Therefore, $N_3 = 220$.

**Number of replacements at the end of 4th month:**

$$N_4 = N_0P_4 + N_1P_3 + N_2P_2 + N_3P_1$$
$$= 536(0.20) + 54(0.35) + 166(0.30) + 220(0.10)$$
$$= 107.2 + 18.9 + 49.8 + 22$$
$$= 197.9 \approx 198$$

Therefore, $N_4 = 198$.

**Number of replacements at the end of 5th month**

$$N_5 = N_0P_5 + N_1P_4 + N_2P_3 + N_3P_2 + N_4P_1$$
$$= 536(0.05) + 54(0.20) + 166(0.35) + 220(0.30) + 198(0.10)$$
$$= 26.8 + 10.8 + 58.1 + 66 + 19.8$$
$$= 181.5 \approx 182$$

Therefore, $N_5 = 182$.

**Calculate the Average Cost for Each Possible Group Replacement Interval:**

The formula for total cost is:

$$\text{Total Cost} = \text{Group replacement cost} + \text{Individual replacement cost}$$

For an interval of $t$months:

$$\text{Total Cost} = 536(₦10) + 40(\text{individual replacements during the interval})$$

and

$$\text{Average Cost per Month} = \frac{\text{Total Cost}}{t}$$

**Cost Table:**

| End of Month | Total Cost of Group Replacement (₦) | Average Cost per Month (₦) |
|---|---|---|
| 1 | $536(10) + 40(54) = 7{,}520$ | **7,520.00** |
| 2 | $536(10) + 40(54 + 166) = 14{,}160$ | **7,080.00** |
| 3 | $536(10) + 40(54 + 166 + 220) = 22{,}960$ | **7,653.33** |
| 4 | $536(10) + 40(54 + 166 + 220 + 198) = 30{,}880$ | **7,720.00** |
| 5 | $536(10) + 40(54 + 166 + 220 + 198 + 182) = 38{,}160$ | **7,632.00** |

(a) **Optimal interval**

From the table, the minimum average cost per month is ₦7,080, which occurs at the end of the 2nd month.

Therefore, the optimal interval for group replacement is every two months.

(b) **Cost of group replacement at the optimal interval**
Cost of group replacement at the optimal interval is ₦7,080 per month.

**ALITER FOR 6(a)**

| Month | Failure rate (%) | Failure Probability ($P_i$) |
|---|---|---|
| 1 | 10 | 0.10 |
| 2 | 30 | 0.30 |
| 3 | 35 | 0.35 |
| 4 | 20 | 0.20 |
| 5 | 5 | 0.05 |
| Total | 100 | 1.00 |

| Month | Number of failures per month |
|---|---|
| 1 | $N_1 = N_0.P_1 = 536(0.10) = 53.6 \approx 54$ |
| 2 | $N_2 = N_0P_2 + N_1P_1 = 536(0.30) + 54(0.10) = 166.2 \approx 166$ |
| 3 | $N_3 = N_0P_3 + N_1P_2 + N_2P_1 = 536(0.35) + 54(0.30) + 166(0.10) = 220.4 \approx 220$ |
| 4 | $N_4 = N_0P_4 + N_1P_3 + N_2P_2 + N_3P_1 = 536(0.20) + 54(0.35) + 166(0.30) + 220(0.10) =$ |
| 5 | $197.9 \approx 198$ |
| | $N_5 = N_0P_5 + N_1P_4 + N_2P_3 + N_3P_2 + N_4P_1 = 536(0.05) + 534(0.20) + 166(0.35) +$ $220.30(0.30) + 198(0.10) = 181.5 \approx 182$ |

| Month | Number of failures | Cumulative Number of failures | Cost of individual replacement | Cost of group replacement | Total cost | Average Total Cost per Month |
|---|---|---|---|---|---|---|
| 1 | 54 | 536 | 54 X40 = 2,160 | 536 X 10 = 5360 | 7,520.00 | 7520/1 = 7,520 |
| **2** | **166** | **220** | **220 X 40 = 8800** | **536 X10 = 5360** | **14,160** | **14160/2 =7,080.00** |
| 3 | 220 | 440 | 440 X40 = 17600 | 536 x10 = 5360 | 22,960 | 22,960/3 = 7,654.13 |
| 4 | 198 | 638 | 638 X 40 = 25520 | 536 x10 = 5360 | 30,880 | 30880.00/4 = 7,720.00 |
| 5 | 182 | 820 | 820 X40 = 32800 | 536 x10 = 5360 | 38,160 | 38160.00/5 = 7632.00 |

(a) Optimal interval period (in month) between group replacement to minimize total cost is 2 months

(b) Total cost of group replacement at the interval of 2 months is ₦7,075.25

## Examiner's comment

Tests Replacement Analysis, specifically the replacement of items that fail suddenly, under the Operations Research component of the QA curriculum. The question provides failurerate information for resistors and asks candidates to determine the optimal interval for group replacement and the corresponding replacement cost. The question tests the candidate's ability to apply Operations Research techniques to replacement-policy decisions and cost minimisation.

Candidates' performance dropped heavily here with only about 35% scoring marks in excess of 6.5.

No wonder, only about 38% of the candidates attempted the question.

A persistent technical pitfall was the computational inaccuracy when calculating cascading cumulative monthly failure ($N_1$ through $N_5$), which skewed the final average total cost matrix column.

# THE ASSOCIATION OF ACCOUNTANCY BODIES IN WEST AFRICA

## ACCOUNTING TECHNICIANS SCHEME, WEST AFRICA
## SEPTEMBER 2026 EXAMINATIONS (PART II)

## INFORMATION TECHNOLOGY

**PLEASE READ THESE INSTRUCTIONS BEFORE COMMENCEMENT OF THE PAPER**

## EXAMINATION INSTRUCTIONS

1. All solutions should be in **blue** or **black** ink. Any solution in pencil will not be marked.
2. Read all instructions on each part of the paper carefully before answering the questions.
3. Ensure that you do not answer more than the number of questions required for **Section B (The Essay Section).**
4. Check your pockets, purse and mathematical sets, etc, to ensure that you do not have prohibited items such as telephone handset, electronic storage device, wrist watches, programmable devices or any form of written material on or around you in the examination hall. You will be stopped from continuing with the examination and liable to further disciplinary actions including cancellation of examination result if caught.
5. Do not enter the hall with anything written on your docket.
6. Insert your examination number in the space provided above.

**TUESDAY, SEPTEMBER 22, 2026**

**DO NOT TURN OVER UNTIL YOU ARE TOLD TO DO SO**

# THE ASSOCIATION OF ACCOUNTANCY BODIES IN WEST AFRICA
# ACCOUNTING TECHNICIANS SCHEME, WEST AFRICA
# PART II EXAMINATIONS - SEPTEMBER 2026

## INFORMATION TECHNOLOGY

**Time Allowed: 3 hours**

**SECTION A: PART I MULTIPLE CHOICE QUESTIONS (30 MARKS)**

**ATTEMPT ALL QUESTIONS IN THIS SECTION**

**Write ONLY the alphabet (A, B, C, D or E) that corresponds to the correct option in each of the following questions/statements.**

1. Combination of elements, which are integrated to one another by means of their inputs and outputs is .....

   A. system
   B. management
   C. database
   D. record
   E. file

2. A measure of the degree or extent of the dependence of subsystems on one another is .....

   A. tight
   B. coupling
   C. decoupling
   D. double
   E. twice

3. The following are the basic elements of control in a business system, **EXCEPT**

   A. planning
   B. collecting facts
   C. comparison
   D. corrective Action
   E. leading

4. Which of the following is **NOT** a feature of information?

   A. It must be detailed
   B. It must be imprecise
   C. It must be accurate

D. It must be easily understood by the recipients
E. It must be timely

5. The smallest unit of data in a Computer System is .....

A. bit
B. byte
C. word
D. nibble
E. character

6. Which of the following is **NOT** a direct input device?

A. Barcode
B. Optical Mark Reader (OMR)
C. Optical Character Reader (OCR)
D. Touch screen
E. Keyboard

7. Which of following is **NOT** a function performed by a mouse?

A. Hovering
B. Dragging
C. Clicking
D. Picking
E. Selecting

8. Which of the following is **NOT** an advantage of Flat Panel Display?

A. They are crude
B. They are lightweight
C. They are compact
D. They provide better resolution than CRT
E. They are modern

9. Which of the following is **NOT** classification of printers?

A. Character Printer
B. Plot Printer
C. Page Printer
D. Ink-Jet Printer
E. Line Printer

10. The Keyboard consists of the following keys, **EXCEPT**

A. alphabetic keys
B. numeric keys
C. control keys
D. pointing keys
E. special character keys

11. Which of the following is **NOT** a main component of an Operating System?

A. A supervisor
B. A command language translator
C. An input/output control system
D. A librarian
E. An Analyst

12. Another name for User's code is .....

A. object code
B. machine code
C. source code
D. intermediate code
E. binary code

13. A program which converts a user's code written in high level language into a machine code is .....

A. assembler
B. compiler
C. debugger
D. moduler
E. file manager

14. Which of the following factors is **NOT** considered when acquiring an application package?

A. Purchase price of the package
B. Type of hardware and Operating System
C. After sales maintenance
D. Access to user's code
E. Technology version of the package

15. Which of the following functions **CANNOT** be performed by word processing package?

A. Text manipulation
B. Mail merging

C. Spell checking
D. Create bar chart
E. Create Tables

16. The following are different types of file organisation, **EXCEPT**

A. serial
B. sequential
C. indexed Sequential
D. random
E. spiral

17. Which of the following is **NOT** a type of computer processing techniques?

A. Batch
B. Real time
C. Multiprocessing
D. Time Sharing
E. Distributed time

18. Centralised processing method provides the following, **EXCEPT**

A. All terminals and other devices are connected to a Server
B. Better control over the processing
C. More experienced IT staff
D. Economics of scale that is cheaper to run
E. No departmental secrecy

19. Which of the following is **NOT** a challenge of decentralised processing method?

A. Less communication cost associated with distribution of information
B. Complexity of coordinating data among the departments
C. Increase in administrative cost
D. Increase in machinery/hardware costs
E. Greater difficulty in implementing effective control

20. The following are the challenges of network, **EXCEPT**

A. access to databases
B. failure of the server
C. cable break may stop the entire network
D. maintenance cost may be prohibitive
E. need for compatibility of equipment in the network

21. A good password should include ……..

A. characters alone
B. numbers alone
C. special characters and numbers
D. characters and special characters
E. characters, numbers and special characters

22. Which of the following is **NOT** a wireless medium?

A. Bluetooth
B. Infra-red
C. Radio waves
D. Microwaves
E. Guided media

23. Which of the following is **NOT** a social media platform?

A. Facebook
B. Instagram
C. WhatsApp
D. LinkedIn
E. Netflix

24. The acronym SMTP means ……..

A. Simple Message Transfer Protocol
B. Special Message Transfer Protocol
C. Simple Mail Transfer Protocol
D. Special Mail Transfer Protocol
E. Soft Message Transfer Protocol

25. PaaS is an acronym for ……..

A. Parallel as a Site
B. Protocol as a Site
C. Platform as a Service
D. Parallel as a Service
E. Platform as a site

26. Who is the right person to write the feasibility study report?

A. Administrative Officer
B. Project Manager

C. Programmer
D. Data Processing Manager
E. System Manager

27. A detailed document which sets out what the client expects and what is expected of the software system which is being developed is .....

A. Feasibility study report
B. Executive summary
C. System specification
D. Evaluation report
E. Terms of reference

28. The following are types of feasibility study, **EXCEPT**

A. operational feasibility study
B. evaluation feasibility study
C. economic feasibility study
D. technical feasibility study
E. social feasibility study

29. Expenses associated with the maintenance and administration of a new system is .....

A. one-off cost
B. operating cost
C. direct cost
D. fixed cost
E. variable cost

30. A practice in which a company hires another company or an individual to perform tasks, handle operations or provide services that are either usually executed or had previously been done by the company's own employees for a fee is .....

A. hiring
B. servicing
C. managing
D. outsourcing
E. crowdsourcing

**SECTION A: PART II SHORT ANSWER QUESTIONS (20 MARKS)**

**ATTEMPT ALL QUESTIONS**

**Write the correct answer that best completes each of the following questions/statements.**

1. The term that refers to recorded raw facts about transactions in an organisation is ……
2. A group of **FOUR** consecutive bits is commonly referred to as ……
3. The term that describes a complete set of fields representing a single data item is ……
4. The bases that applied in quaternary numeral systems is……
5. The technical term used for the process of converting data to computer compatible form is ……
6. The characteristic of information that ensures its delivery when required is ……
7. The …… replaced vacuum tube in second-generation computer systems.
8. The emerging technology that characterises fifth-generation computing is ……
9. The type of computer that integrates both continuous and discrete processing capabilities is ……
10. The personal computer is …….. class of computer.
11. The processing model that distributes tasks across multiple sites is ……
12. In a single-user system, the processing technique that executes multiple tasks concurrently is ……
13. The data storage medium that utilises magnetic platters for information retention is ……
14. The input control mechanism that ensures the correctness of entered data is ……

15. The component of computer system that executes tasks is .....

16. The storage control strategy that safeguards against accidental data loss is .....

17. The category of software that manages computer hardware and system resources is .....

18. The program that translates high-level source code into machine language is .....

19. The type of operating system that supports concurrent processing by multiple CPUs is .....

20. Software that is designed to perform specific user-oriented tasks is .....

**SECTION B: ATTEMPT ANY FOUR QUESTIONS (50 MARKS)**

**QUESTION 1**

(a) State the reason why data is sometimes regarded as information and vice- versa. (2 Marks)

(b) Define the following terms and give one illustrative example in each case:

i. Data item/field (2 Marks)
ii. Record (2 Marks)
iii. File (2 Marks)
iv. Database (2 Marks)

(c) State **ONE** distinction between analog computer and a digital computer. (2½ Marks)

**(Total 12½ Marks)**

**QUESTION 2**

(a) Printer is a computer device for producing hardcopy output.

**Required:**

i. State **ONE** distinction between impact printer and non-impact printer. (2 Marks)
ii. List **TWO** examples of impact printer and two examples of non-impact printer. (2 Marks)

iii. Enumerate **FIVE** factors to be considered before acquiring a printer for use. (5 Marks)

(b) i. What is a cache memory? (1½ Marks)

ii. State **FOUR** features of computer display unit. (2 Marks)

**(Total 12½ Marks)**

## QUESTION 3

(a) What are controls in an accounting environment? (2½ Marks)

(b) Enumerate **TWO** benefits and two lapses of using program flowcharts. (4 Marks)

(c) One category of network-centred computing is grid computing.

**Required:**

i. Define grid computing. (2 Marks)

ii. Enumerate **TWO** advantages and **TWO** disadvantages of grid computing. (4 Marks)

**(Total 12½ Marks)**

## QUESTION 4

(a) Processing of jobs/tasks on computers can be done in several ways depending on the type of CPU and operating system in use.

**Required:**

i. Define Time-sharing processing. (1½ Marks)

ii. State **TWO** distinctions between symmetric and asymmetric multiprocessing techniques. (3 Marks)

iii. Enumerate **THREE** benefits and **TWO** lapses of multiprocessing technique. (5 Marks)

(b) State **ONE** major function of each of the following information system personnel/staffers:

i. Business Analyst (1 Mark)

ii. Network Engineer (1 Mark)

iii. Systems Analyst (1 Mark)

**(Total 12½ Marks)**

**QUESTION 5**

(a) What is a network protocol? (1½ Marks)

(b) State **THREE** distinctions between data communication and computer network. (3 Marks)

(c) Enumerate **FOUR** differences between cabled/wired network and wireless network. (4 Marks)

(d) State **TWO** examples each for the categories in (c) above. (4 Marks)

**(Total 12½ Marks)**

**QUESTION 6**

(a) i. What is information system development? (1½ Marks)

ii. Enumerate **FIVE** likely reasons for developing an information system. (5 Marks)

(b) Enumerate **THREE** benefits of system specification. (3 Marks)

(c) State **ONE** function of each of the following disruptive technologies:

i. Artificial Intelligence (AI). (1½ Marks)

ii. Distributed Ledger (Block chain). (1½ Marks)

**(Total 12½ Marks)**

## SOLUTIONS
### Multiple Choice

1. A
2. B
3. E
4. B
5. A
6. E
7. D
8. A
9. B
10. D
11. E
12. C
13. B
14. D
15. D
16. E
17. E
18. E
19. A
20. A
21. E
22. E
23. E
24. C
25. C
26. B

27. C

28. B

29. B

30. D

**Examiners' report**

This is made up of thirty multiple-choice questions spread across the whole segments of the syllabus, and the candidates are expected to answer all the questions.

The performance was good. The outstanding performance of the candidates in this section(part) helped many candidates in their overall performance.

## Short Answer Questions

1. Data
2. Nibble
3. Record
4. Base 4 or 4
5. Data Preparation / Data Conversion / Data Digitisation / Data Transformation
6. Timeliness / Availability
7. Transistors
8. Artificial Intelligence (AI)
9. Hybrid Computer
10. Micro Computer
11. Distributed Processing
12. Multitasking
13. Hard Disk Drive / Hard Disk
14. Data Validation / Input Validation
15. Central Processing Unit (CPU)
16. Backup
17. System Software / Operating system
18. Compiler / interpreter
19. Multiprocessing operating system / Multiprocessing
20. Application Software

**Examiners' report**

This section consists of twenty short-answer questions (SAQ). The questions were also spread to cover the entire syllabus. All candidates were expected to attempt all the questions because it is a compulsory section.

The performance was below average. This is due to the fact that the students did not cover the entire syllabus in their preparation for the exam. Students are hereby advised to start preparing early for future examinations in order to cover the entire syllabus.

**Solution 1:**

**1(a)** Data is sometimes regarded as information and vice-versa, in that when data undergoes processing or manipulation, it produces information. This information can then be reused as data for further processing to yield new information.

Data ⟶ Processing ⟶ Information ⟶ Processing ⟶ Information
(Data)

**b) Definitions and Examples**

**i. Data Item / Field**

A data item or field is the smallest meaningful unit of data in a record. It represents a particular characteristic or attribute of an entity OR it is a combination of characters. It is an item of data in a record, e.g name, sex, age etc which are all fields in a student record.

**ii. Record**

A record is information about a particular entity, which could be an item or a person. It is a collection of related fields that describes one particular entity or item. Example: Student data which may contain name, matric number, sex, address, dept etc.

**iii. File**

A file is a collection of related records stored together and given a name for easy identification and retrieval. Example: Records of all accounting students with their respective data in a particular class.

**iv. Database**

A database is an organized collection of related data stored electronically so that it

can be easily accessed, managed, updated, and retrieved. It is a collection of data of an organization or related organization well arranged, organized and stored in a central system to be accessed by authorized users. Example: Files of students in Accounting, Computer science, Mechanical, Banking etc collected together in a central system for easy access and retrieval.

Full illustration and practical examples on data items/field record, file and database are as demonstrated below:

**ATSWA II SEPTEMBER 2026 DIET**

| S/N | NAME | AGE | SEX | NO OF PAPER | REG. NO |
|---|---|---|---|---|---|
| 1 | Adeola Aminat Olanike | 20 | F | 4 | AT/321002 |
| 2 | Hammed kola Ogooluwa | 22 | M | 4 | AT/301442 |
| 3 | Lawal Jeremiah Adeola | 18 | M | 3 | AT/280092 |
| 4 | Jomiloju Oreoluwa Titilope | 21 | F | 4 | AT/276032 |
| 5 | Orimogunje Olagunju Ope | 24 | F | 2 | AT/321873 |

In the above table, examples of Data item/field, record, file and database can be identified as follows:

i. **Data item/field:** It is an item of data in a record. In the above table there are six data item/field which are: Serial Number, Name, Age, Sex, number of paper and registration number.
ii. **Record:** It is information about a particular entity. In the above table, each row is an entity and it contains five data items/fields.
iii. **File:** it is a collection of related records; therefore, the table above is used to keep records of ATSWA level 2 students for September 2026 diet. This means the whole table is a file.
iv. **Database:** if the above table or file is combined with other files of a company or related companies stored in a central system to be accessed by authorized users, it becomes a database.

c) Distinctions Between Analog and Digital Computers

| S/N | ANALOG | DIGITAL |
|---|---|---|
| 1 | Processes data in continuous values. | Processes data in discrete/binary values (0 1). |
| 2 | Results are usually represented as continuous signals or readings | Results are represented using numbers, characters, graphics, etc. |
| 3 | It has lower precision than digital computers. | It provides higher precision and accuracy. |
| 4 | Measures of physical quantities such as temperature, pressure and speed. | Processes numerical, textual, audio and other digitally represented data. |

Examiners' report

This question was designed to test the candidate's understanding of the relationship between Data and Information. It also tested data arrangement in a database and types of computers based on technology.

This question is a popular and highly frequent question. Candidates are very familiar with this question.

Over 80% of the candidates attempted this question. The performance was slightly above average because about 50% of the candidates who attempted the question scored above 50%.

Solution 2:

a. i. Distinctions between impact printer and non-impact printer

| | IMPACT PRINTER | NON-IMPACT PRINTER |
|---|---|---|
| 1 | It is old technology | It is new technology |
| 2 | It is very slow | It is very fast |
| 3 | It does not have good quality output | It has good quality output |
| 4 | It makes noise when printing | It does not make noise when printing |
| 5 | It cannot print a page at a time | It can print a page at a time |
| 6 | It uses the technology of manual typewriter | It uses the technology of photocopy machine |

ii. Examples of impact and non-impact printer include:

Impact printer:

1. Line printers
2. Daisy wheel printers
3. Dot matrix printers

4. Drum Printers
5. Character Printers
6. Chain Printers

**Non-impact Printer:**

1. Thermal printers
2. Electrostatic printers
3. Ink-jet printers
4. Xerographers
5. Lasers printers
6. Deskjet printers
7. Dye-sublimation printers
8. LED printers etc.

**iii. Factors to be considered before acquiring a printer include:**

- Speed of the printer
- Quality of output from the printer
- Range of print fonts
- Graphic capability
- Cost of purchase of the printer
- Cost of operation of the printer
- Associated noise level
- Printer connectivity (Wi – Fi, Bluetooth, USB etc)
- Physical size and physical features of the printer.
- Type of hardcopy output needed (black and white or coloured printing)
- Functions to be performed by the printer (single or multifunction)
- Paper handling and capacity of the printer
- Warranty and support

**b. (i)** Cache memory is a small, very fast memory that stores frequently accessed data and instructions to speed up processing by the computer. It is a fast memory that acts as a buffer between the CPU and main memory providing quicker access to information the CPU is likely to need soon.

OR

Cache memory is a small, high – speed memory that stores frequently accessed data and instructions, enabling the CPU to retrieve information much faster than accessing the main memory (RAM). Example: CPU cache, Browser cache, Disk cache, in-memory cache.

**(ii) Features of computer display unit include:**

1. Higher resolution for detail and sharp display.
2. Higher refresh rate for smooth motion.
3. Response time measures how quickly a motion's pixels can change colour.

4. Screen size which determines how much of the image can be seen at once
5. Aspect ratio which defines proportional relationship between width and height of the screen. Ultra-wide monitors offer wider field of view.
6. Connectivity option by offering various parts of connections to computers and other devices (such as Display part, USB-C etc)
7. Panel type for different viewing angles, colour, accuracy and response times.
8. Colour accuracy is essential for graphic design, and video editing that requires good colours.
9. Brightness and contrast ratio.
10. Ergonomic feature in terms of adjustable stands to maintain comfortable viewing angles.
11. Display technology such as LCD, LED, OLED, and AMOLED.

**Examiners' report**

This question tested candidates' knowledge of computer output devices, display units, and computer memory. Because this topic is familiar, a very serious candidate was expected to perform well.

While 75% of the candidates attempted the question, overall performance was only average. Performance would have been better if candidates had made more effective use of the ICAN materials.

**Solution 3:**

**a. Controls in an Accounting Environment**

Controls in an accounting environment can be defined as policies, procedures, rules, and measures established by an organization to protect its assets, ensure accurate and reliable accounting records, prevent and detect errors and fraud, as well as ensure compliance with laws and organizational policies.

**Examples are:**

i. Authorization of transactions,

ii. Segregation of duties,

iii. Internal audit,

iv. Reconciliation,

v. Physical security of assets.

**b. Benefits of using flowcharts include:**

i. It is an aid to problem definition and program writing.
ii. It is more complete for it contains both start and end instructions together with illustration of loops.

iii. It can be used to test whether a program will work by dry running.
iv. It is included as part of the program documentation for future reference, maintenance and training of users.
v. Flowcharts help to break down complex problems into smaller more manageable steps making it easier to develop effective solutions.
vi. It can be used to analyze the flow of data and identify bottlenecks or areas where the process can be optimized.
vii. It act as a valid aid, facilitating communication and collaboration among team members during development process.
viii. It can help to pinpoint the exact location of errors or bugs and guide the debugging process.
ix. By using pictures instead of complicated code, it enables users and technical staff to visualize how the program works.

**Lapses of Program Flowchart Include:**

1. It is time-consuming to prepare, especially for complex programs.
2. It can become complicated when the program has many processes and decisions.
3. Difficult to modify because changes may require redrawing parts of the flowchart.
4. Requires knowledge of standard symbols to interpret correctly.
5. May occupy a lot of space for large programs.
6. Can become outdated when the program is modified but the flowchart is not updated.
7. Does not show detailed programming syntax, so it cannot completely replace program code.
8. Traditional hand-drawn symbols are difficult to type, share, or edit without specialized programming software.
9. No universally enforced standard, so interpretation may vary.

**c.** i Grid computing is a model or system where multiple independent computers connect over a network, together as a single, virtual supercomputer. OR

It is the process of joining individual computers or servers together in a network to share their idle processing power, memory or storage with a central server acting as a central manager to coordinate the network.

### ii. Advantages and Disadvantages of Grid Computing:

#### Advantages of Grid Computing Include:

1. Increased processing power due to the combination of the resources of several computers.
2. Resource sharing is possible because users can share computing power, storage, and other resources.
3. It is cost-effective because existing computers can be combined instead of purchasing a single highly expensive supercomputer.
4. It is scalable because more computers can be added when additional resources are needed.
5. It provides faster processing as large tasks can be divided among several computers and processed simultaneously.
6. Improved resource utilization because Idle computing resources can be used by other tasks.
7. It supports complex applications, which is useful for scientific research, simulations, engineering, and large-scale data processing.
8. It is fault-tolerant because failure of one node does not stop the processing.
9. It enhances better collaboration among dispersed teams and organizations through working together seamlessly on large-scale shared research and projects.

#### Disadvantages of Grid Computing Include:

1. It is complex to manage, as setting up and managing a grid can be complicated.
2. Connecting many computers and networks can create security vulnerabilities.
3. Poor or unreliable network connections can affect performance since it is network dependent.
4. High cost of setup
5. High cost of maintenance
6. Setting up and administration require special skills
7. Data transfer delays can occur when moving large amounts of data between computers which can slow down processing.
8. There is compatibility problems in that different computers, operating systems, and software may not work together easily.
9. Problems with participating computers or networks can affect grid operations.

**Examiners' report**

This question tested candidates' knowledge and understanding of controls, use of program flowcharts, and the importance of grid computing. The question is within the reach of most candidates, most especially the controls and program flowcharts.

Less than 40% of the candidates attempted this question, with a performance below average. This is because less than 50% of those who attempted the question scored above 40%.

**Solution 4:**

**4 (a)**

**(i) Time-Sharing Processing**

Time-sharing processing is a method of computer processing in which the central processing unit (CPU) shares its processing time among several users or programs, giving each user a small time slice in turn.

OR

It is a kind of processing in which the system interacts with many users, giving each of them fast individual attention on a time-slice basis. It allows many users to share the computer's processing resources simultaneously.

**Example:** A university computer server allowing many students to access applications at the same time.

**(ii) Distinctions Between Symmetric and Asymmetric Multiprocessing**

| S/N | SYMMETRIC MULTIPROCESSING | ASYMMETRIC MULTIPROCESSING |
|---|---|---|
| 1 | All processors are treated equally. Each processor can execute operating-system tasks. | One processor usually acts as the master while others act as slaves. |
| 2 | Processors share system resources. | The master processor controls or assigns tasks to other processors. |
| 3 | Workload can be distributed dynamically. | Workload is usually assigned according to predefined responsibilities. |
| 4 | It is more flexible and generally provides better load balancing. | Simpler to design and manage. |
| 5 | Failure of one processor may not necessarily stop the whole system. | Failure of the master processor can significantly affects the system. |
| 6 | Each processor schedules itself | Only the master processor does the scheduling. |

**(iii) Benefits and Limitations of Multiprocessing**

**Benefits of Multiprocessing Include:**

1. It enables faster processing

2. Multiple processors can execute tasks simultaneously.
3. Improved performance by dividing large workloads among processors.
4. Increased reliability because the system may continue to operate if one processor fails.
5. Better processing resource utilization
6. Supports multitasking because several programs can run concurrently.
7. Increased throughput by completing more jobs within a given period.
8. Scalability: Additional processors can increase processing capacity.
9. It is economical when compared with several separate single-processor systems because peripherals and storage are shared.
10. It is suitable for real-time and complex tasks.

**Limitations of Multiprocessing Include:**

1. It is very expensive to implement because multiple processors and supporting hardware can be very costly.
2. It is complex to design: Multiprocessing systems are more difficult to design and manage.
3. Software requirements: Applications and operating systems may need to support multiprocessing.
4. Synchronization problems: Processors must coordinate their activities properly, which may be difficult.
5. Higher maintenance requirements: More components may require more technical support.
6. Heat generation: Multiple processors can generate excessive heat.
7. Processing resource contention: Processors may compete for memory and other shared resources.
8. Speed-up is not in proportion to the number of processors.
9. Failure of a shared resource can affect the whole system.

## b) Functions of Information System Staff

### i. Business Analyst

**Functions of Business Analyst Include:**

1. Identifies the organization's business needs and problems.
2. Gathers and documents user requirements.

3. Analyzes existing business processes.
4. Recommends improvements and possible solutions.
5. Communicates business requirements to developers and system analysts.
6. Helps evaluate proposed information systems.
7. Assists in testing the system to ensure it meets business requirements.
8. Acts as a link between the organizational business users and the technical team.

ii. **Network Engineer**

**Functions of a Network Engineer Include:**

1. Designs and implements computer networks.
2. Installs and configures routers, switches, and other network equipment.
3. Monitors network performance.
4. Troubleshoots network problems.
5. Maintains network security.
6. Manages network connections and communication services.
7. Performs network upgrades and maintenance.
8. Ensures reliable connectivity among computers and other devices.

iii. **Systems Analyst**

**Functions of Systems Analyst Include:**

1. Studies existing systems and identifies problems.
2. Determines system requirements.
3. Analyzes user needs.
4. Designs proposed system processes and specifications.
5. Prepares system documentation.
6. Works with programmers and other IT professionals during development.
7. Participates in system testing and implementation.
8. Recommends improvements to existing information systems.

**Examiners' report**

This question tests candidates' knowledge of processing techniques and methods, as well as the functions of information systems personnel. Since this question covers one of the common areas expected by candidates, student performance is expected to be impressive.

Approximately 65% of the candidates attempted the question, and more than 52% scored above average.

**Solution 5:**

5(a). **Network Protocol**

A network protocol is a set of rules and standards that govern how data is transmitted, received, and communicated between devices on a computer network. It is a set of rules or standards designed to enable computers to connect to one another and to exchange information with as little error as possible. It governs the movement of signal or data within a network.

**Examples are:**

1. Internet Protocol (IP)
2. Transmission Control Protocol (TCP)
3. Wireless Application Protocol (WAP)
4. File Transfer Protocol (FTP)
5. Hypertext Transfer Protocol (HTTP)
6. Internet Relay Chat Protocol (IRCP)
7. Post Office Protocol (POP)
8. Simple Mail Transfer Protocol (SMTP)
9. Serial Line Internet Protocol (SLIP)
10. Simple Network Management Protocol (SNMP)
11. Point-to-point Protocol (PPP)

b) Distinctions Between Data Communication and Computer Network

| S/N | DATA COMMUNICATION | COMPUTER NETWORK |
|---|---|---|
| 1 | Refers to the exchange or transmission of data between two or more devices. | Referring to a collection of interconnected computers and devices that communicate and share resources. |
| 2 | Focuses mainly on how data is transmitted. | Focuses on connecting devices and enabling resource sharing. |
| 3 | It can occur between two devices without a large network | It usually consists of several interconnected devices. |
| 4 | Requires a sender, receiver, transmission medium, and communication protocol. | Requires devices, network media, networking equipment, and protocols. |

c) Differences between Cabled Wired and Wireless Networks

| S/N | WIRED NETWORKS | WIRELESS NETWORKS |
|---|---|---|
| 1 | It uses physical cables to transmit data | It uses radio waves or other wireless signals to transmit data |
| 2 | It requires physical cabling between communicating devices | Does not require physical cables between communicating devices |
| 3 | It provides a more stable connection. | Connection can be affected by interference and physical obstacles. |
| 4 | It offers higher and more consistent speeds. | Speed may vary depending on signal strength and interference. |
| 5 | It is difficult to install or relocate | It is easier to install and allows greater mobility or relocation |
| 6 | It provides better physical access control. | It requires strong wireless security to prevent unauthorized access. |
| 7 | Devices must normally remain connected to the cable | Devices can move within the network's coverage area. |
| 8 | Wired networks are costly | Wireless network is less costly |

d) Examples of Cabled Wired and Wireless Networks

Examples of Wired/Cabled Networks Include:

1. Twisted-pair cable network
2. Ethernet network
3. Coaxial cable network

4. Fibre-optic network
5. Traditional Telephone (PSTN)

**Examples of Wireless Network Include:**

1. Bluetooth network
2. Wi-Fi network
3. Cellular/mobile network (4G/5G)
4. Satellite communication network
5. WI MAX network

**Examiners' report**

This question focuses on different aspects of networks. Students are expected to perform very well if they have deep knowledge and a good understanding of the topic.

Infact, 70% of the candidates attempted this question. The performance was excellent, which highly contributed to the overall exam results.

**Solution 6:**

**6 (a) i. Information System Development**

Information system development is the process of developing a new system or amending an existing one. It is the process of planning, analyzing, designing, building, testing, implementing, and maintaining an information system to meet the needs of an organization or its users. It combines technology, workflows, data and people to help businesses to run more efficiently and make better decisions.

**ii. Reasons for Developing an Information System Include:**

1. To solve existing business problems.
2. To improve efficiency and effectiveness
3. Reducing operating costs.
4. To provide accurate and timely information for decision-making.
5. To enhance better stock control.
6. To automate manual processes.
7. To improve data storage and retrieval.
8. To enhance communication and information sharing.
9. To replace an outdated system.

10. To meet changes in business requirements.
11. To gain competitive advantage over others.
12. To improve customer service.
13. To generate more revenue from the activities of the organization.
14. Ensuring regulatory compliance.
15. To ensure better data integrity, easier backups, and stronger protection against cyber threats.
16. To support strategic growth of the system.

**b) Benefits of System Specification Include:**

1. Provides clear requirements for system development.
2. It is needed by Systems Analysts and programmers to enable them to design systems and write programs.
3. It serves as a contract document between the Electronic Data Processing (EDP) and user department
4. Reduces misunderstandings between users and developers.
5. Helps control project scope and prevents unnecessary features.
6. Makes testing easier because requirements can be used as testing criteria.
7. It acts as a reference document during development, testing and implementation stages of the system.
8. Improves system quality by clearly defining expected performance.
9. Helps estimate cost and resources required for development.
10. It serves as an operating manual for users
11. Provides documentation for future maintenance and upgrades.
12. Reduces development errors and rework.
13. Helps ensure that the final system meets users' needs.

**c) (i) Functions of Artificial Intelligence (AI) Include:**

1. Automates routine tasks.
2. Analyzes large volumes of data quickly.
3. Supports decision-making through intelligent recommendations.
4. Recognizes speech and images.

5. Provides chatbots and virtual assistants.
6. Detects fraud and unusual activities.
7. Predicts trends and future outcomes.
8. Personalizes products and services based on user behavior.
9. Supports medical diagnosis and research.
10. Improves cybersecurity by detecting suspicious activities.

**(ii) Functions of Distributed Ledger (Blockchain) Include:**

1. Records transactions in a shared digital ledger.
2. Provides transparency because authorized participants can verify records.
3. Improves data integrity by making unauthorized alterations difficult.
4. Supports secure peer-to-peer transactions.
5. Reduces dependence on intermediaries in some transactions.
6. Provides traceability of transactions and assets.
7. Supports smart contracts that can automatically execute agreed conditions.
8. Helps prevent fraud and double spending in suitable applications.
9. Supports digital identity and verification.
10. Facilitates cryptocurrency and other digital-asset transactions.

**Examiners' report**

This question tests candidates' knowledge of system development, a topic they are very familiar with, and disruptive technology, which they may not be well versed in. However, the introduction of this question is a welcome development.

Less than 30% of the candidates attempted the question. The performance was poor because the candidates demonstrated a weak understanding of the topics. Students are hereby advised to study the ICAN manual thoroughly and in detail for future examinations.