

**SUBJECT: APPLIED MATHEMATICS (241)**  
**SAMPLE QUESTION PAPER**  
**CLASS- XII (2026-27)**

**Maximum Marks: 80**

**Time Allowed: 3 Hours**

**General Instructions:**

Read the following instructions very carefully and strictly follow them:

1. This Question paper contains 38 questions. All questions are compulsory.
2. This Question paper is divided into five Sections - A, B, C, D and E.
3. In Section A, Questions no. 1 to 18 are multiple choice questions (MCQs) and Questions no. 19 and 20 are Assertion-Reason based questions of 1 mark each.
4. In Section B, Question number 21 to 25 are Very Short Answer (VSA)-type questions, carrying 2 marks each.
5. In Section C, Question number. 26 to 31 are Short Answer (SA)-type questions, carrying 3 marks each.
6. In Section D, Question number 32 to 35 are Long Answer (LA)-type questions, carrying 5 marks each.
7. In Section E, Question number 36 to 38 are case study-based questions carrying 4 marks each.
8. There is no overall choice. However, an internal choice has been provided in 2 questions in Section B, 2 questions in Section C, 2 questions in Section D and one sub-part each in 2 questions of Section E.
9. Draw neat and clean figures wherever required. Take  $\pi = \frac{22}{7}$  wherever required, if not stated
10. Use of calculators is not allowed.

| SECTION – A <span style="float: right;">(20 x 1 = 20)</span>                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                       |       |
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| This section comprises of 18 multiple choice questions and two assertion and reason type questions of 1 mark each. |                                                                                                                                                                                                                                                                                                                                                                                                                                                       |       |
| Q. NO.                                                                                                             | Question                                                                                                                                                                                                                                                                                                                                                                                                                                              | Marks |
| 1.                                                                                                                 | Given two integers $a, b$ such that $a < b$ and $c$ be any non-zero integer then which of the following always holds true:<br><div style="display: flex; justify-content: space-between;"> <span>(A) <math>a - c &gt; b - c</math></span> <span>(B) <math>ac &lt; bc</math></span> </div> <div style="display: flex; justify-content: space-between;"> <span>(C) <math>ac &gt; bc</math></span> <span>(D) <math>a + c &lt; b + c</math></span> </div> | 1     |
| 2.                                                                                                                 | Vessel A contains milk and water in the ratio <b>4 : 5</b> . Vessel B contains milk and water in the ratio <b>5 : 1</b> . In what ratio should quantities be taken from both vessels to form a mixture in which milk and water are in the ratio <b>5 : 4</b> ?<br><div style="display: flex; justify-content: space-between;"> <span>(A) 5 : 2</span> <span>(B) 5 : 3</span> <span>(C) 4 : 1</span> <span>(D) 1 : 4</span> </div>                     | 1     |
| 3.                                                                                                                 | Number of symmetric matrices of order $3 \times 3$ with each entry 1 or $-1$ is<br><div style="display: flex; justify-content: space-between;"> <span>(A) 512</span> <span>(B) 64</span> <span>(C) 8</span> <span>(D) 4</span> </div>                                                                                                                                                                                                                 | 1     |
| 4.                                                                                                                 | In a car race, car A beats car B by 45 km, car B beats car C by 50 km, and car A beats car C by 90 km then the length of the race course is<br><div style="display: flex; justify-content: space-between;"> <span>(A) 400 km</span> <span>(B) 450 km</span> <span>(C) 500 km</span> <span>(D) 550 km</span> </div>                                                                                                                                    | 1     |

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| 5.  | If $x = \log t$ and $y = t^2$ , then value of $\frac{d^2y}{dx^2}$ at $t = \frac{1}{\sqrt{2}}$ is<br>(A) 4 (B) 2<br>(C) $2\sqrt{2}$ (D) 1                                                                                                                                                                                                                                                                                                       | 1 |
| 6.  | Which of the following statements about the future value (FV) of a perpetuity is true?<br>(A) The future value can be calculated by compounding the present value to a specific future date.<br>(B) The future value is equal to twice the present value multiplied by number of payments.<br>(C) The future value is always equal to the total cash flows received up to the future date.<br>(D) The future value of perpetuity is undefined. | 1 |
| 7.  | The order of the differential equation whose general solution is given by $y = (a + b)\log(x + c) - de^{x+k}$ where a, b, c, d and k are arbitrary constants, is<br>(A) 4 (B) 5 (C) 3 (D) 2                                                                                                                                                                                                                                                    | 1 |
| 8.  | The Marginal Revenue (MR) of a company is given by the function $MR(x) = 20e^{0.5x}$ where $x$ is the number of units sold. The additional revenue generated when sales increase from 2 units to 4 units is:<br>(A) $20e^2$ (B) $20(e^2 - e^1)$<br>(C) $40e^2$ (D) $40(e^2 - e^1)$                                                                                                                                                             | 1 |
| 9.  | In the context of standard reducing-balance EMI, over the loan period, which of the following is correct?<br>(A) Principal and Interest components both remain constant.<br>(B) Principal component decreases, and Interest component increases.<br>(C) Principal component increases, and Interest component decreases.<br>(D) Principal component remains constant, and Interest component decreases.                                        | 1 |
| 10. | If you are willing to pay ₹ 40,000 today for an investment that promises to pay ₹ 3,200 at the end of every year indefinitely, then the implied rate of return is<br>(A) 6 % (B) 8 % (C) 10 % (D) 12.5 %                                                                                                                                                                                                                                       | 1 |
| 11. | A foreign research lab observes that the number of microscopic defects on a solar-panel surface follows a Poisson distribution with mean 2 defects per $100\text{ cm}^2$ . If a scientist inspects an area of $250\text{ cm}^2$ , what is the probability that exactly 1 defect is found?<br>(A) $6e^{-5}$ (B) $5e^{-5}$ (C) $4e^{-5}$ (D) $3e^{-2}$                                                                                           | 1 |
| 12. | Which of the following statement(s) is/are true:<br>I: The mean of a population is denoted by $\bar{x}$ .<br>II: The population mean is a statistic.<br>(A) I only (B) II only (C) Both I and II (D) Neither I nor II                                                                                                                                                                                                                          | 1 |

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| 13. | Two random variables $X$ and $Y$ have the same mean $\mu = 50$ . If $Var(X) = 100$ and $Var(Y) = 25$ , which statement is TRUE?<br>(A) $X$ is more consistent than $Y$<br>(B) $Y$ is more consistent than $X$<br>(C) Both have equal consistency<br>(D) Cannot be determined with the given data                                                                                                                                                                                                                                                                                                                                 | 1 |
| 14. | A trend line is considered the best fit when the sum of squares of residuals is<br>(A) Maximum (B) Minimum (C) Positive (D) Negative                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 1 |
| 15. | A sample of 100 cereal boxes has mean = 505g and SD = 15g. The 99% confidence interval for the true mean $\mu$ is (501.125, 508.875) grams. Which of the following is the correct interpretation of this interval?<br>(A) 99% of repeated samples will have means in the interval (501.125, 508.875) grams.<br>(B) The probability that the mean weight, $\mu$ , is between 501.125 and 508.875 grams is 0.99.<br>(C) We are 99% confident that the calculated interval of (501.125, 508.875) grams contains the true mean weight $\mu$ .<br>(D) Approximately 99% of all boxes have a weight between 501.125 and 508.875 grams. | 1 |
| 16. | Let $X$ be a random variable following the binomial distribution $B(6, p)$ . If $2 P(X = 4) = 3 P(X = 3)$ , then the value of $p$ is:<br>(A) $\frac{1}{3}$ (B) $\frac{1}{2}$ (C) $\frac{2}{3}$ (D) $\frac{3}{4}$                                                                                                                                                                                                                                                                                                                                                                                                                 | 1 |
| 17. | Suppose a random variable $X$ follows the binomial distribution with parameters $n$ and $p$ , where $0 < p < 1$ . If $\frac{P(X=r)}{P(X=n-r)}$ is independent of $n$ and $r$ , then $p$ equals<br>(A) $\frac{1}{2}$ (B) $\frac{1}{3}$ (C) $\frac{1}{5}$ (D) $\frac{1}{7}$                                                                                                                                                                                                                                                                                                                                                        | 1 |
| 18. | A firm manufacturing two types of lubricants whose non-negative production quantities, represented by decision variables $x$ and $y$ satisfy the following constraints:<br>$x \geq 2, \quad y \leq 3, \quad x + y = 5$<br>Then the feasible region of the above LPP is:<br>(A) A triangle<br>(B) A quadrilateral<br>(C) A line segment<br>(D) unbounded                                                                                                                                                                                                                                                                          | 1 |

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| <p style="text-align: center;"><b>Assertion-Reason Based Questions</b></p> <p><b>Directions:</b> Question numbers 19 and 20 are Assertion and Reason based questions carrying 1 mark each. Two statements are given, one labelled Assertion (A) and the other labelled Reason (R).<br/> <b>Select the correct answer from the options (A), (B), (C) and (D) as given below:</b><br/>         (A) Both Assertion (A) and Reason (R) are true and (R) is the correct explanation of Assertion (A).<br/>         (B) Both Assertion (A) and Reason (R) are true but (R) is not the correct explanation of Assertion (A).<br/>         (C) Assertion (A) is true but Reason (R) is false.<br/>         (D) Assertion (A) is false but Reason (R) is true.</p> |                                                                                                                                                                                                                                                                                                                                                           |   |
| 19.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <p><b>Assertion (A):</b> Let <math>A</math> be a non-singular square matrix of order 3. If <math> A  = 4</math>, then the value of <math> 2 \cdot adj(A) </math> is 128.</p> <p><b>Reason (R):</b> For a matrix <math>A</math>, <math> adj(A)  =  A ^{n-1}</math> and <math> kA  = k^n  A </math></p>                                                     | 1 |
| 20.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <p><b>Assertion (A):</b> If two probability distributions have the same mean, they must have the same variance.</p> <p><b>Reason (R):</b> Variance measures the spread of data around the mean and is calculated as <math>Var(X) = E(X^2) - [E(X)]^2</math></p>                                                                                           | 1 |
| <p style="text-align: center;"><b>SECTION – B</b> <span style="float: right;"><b>(5 x 2 = 10)</b></span></p> <p style="text-align: center;"><b>This section comprises of 5 very short answer (VSA) type questions of 2 marks each.</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                           |   |
| 21(A).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | If $x$ is an odd integer, show that $x^2 \equiv 1 \pmod{8}$                                                                                                                                                                                                                                                                                               | 2 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>OR</b>                                                                                                                                                                                                                                                                                                                                                 |   |
| 21(B).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | If $3^{333} \equiv x \pmod{11}$ , find $x$ .                                                                                                                                                                                                                                                                                                              |   |
| 22.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | An asset was purchased for ₹120,000 with an expected salvage value of ₹10,000 and 10-year useful life. What is the asset's book value at the end of sixth year?                                                                                                                                                                                           | 2 |
| 23.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | A man rows 12 km downstream and 12 km upstream, taking 4 hours in total. If the speed of the stream is 4 km/h, find the speed of the man in still water.                                                                                                                                                                                                  | 2 |
| 24(A).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | The number of customer complaints received by an e-commerce company follows a Poisson distribution. It is observed that the probability of receiving exactly 2 complaints in a day is equal to the probability of receiving exactly 3 complaints in a day. Find the mean and the variance of the distribution.                                            | 2 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>OR</b>                                                                                                                                                                                                                                                                                                                                                 |   |
| 24(B).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <p>A metro station observes that trains arrive at a particular platform at an average rate of 20 trains per hour during peak hours.</p> <p>(i) What is the expected number of trains arriving in a 6-minute interval?</p> <p>(ii) Find the probability that exactly 2 trains arrive in a 6-minute interval.</p> <p>[Use <math>e^{-2} = 0.1353</math>]</p> |   |

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| 25.                                                                                                                                                                                                                                  | <p>The feasible region for an LPP is shown as in the graph below:</p> <p>Frame all the constraints of the LPP represented by the above graph.</p>                                                                                                                                                                                                                                                                                                        | 2 |
| <p style="text-align: center;"><b>SECTION – C</b> <span style="float: right;"><b>(6 x 3 = 18)</b></span></p> <p style="text-align: center;"><b>This section comprises of 6 short answer (SA) type questions of 3 marks each.</b></p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                          |   |
| 26(A).                                                                                                                                                                                                                               | <p>The price of a stock S (in dollars) t days after its IPO is modeled by <math>S(t) = \frac{4t^2+1}{t}</math>, <math>t &gt; 0</math>. Show that the stock price decreased for the first half of the opening day and then started increasing thereon.</p>                                                                                                                                                                                                | 3 |
|                                                                                                                                                                                                                                      | <b>OR</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                |   |
| 26(B).                                                                                                                                                                                                                               | <p>Consider a simple market where quantity demanded is <math>Q_d = 15 - 2P</math> and quantity supplied is <math>Q_s = 3P - 5</math>. The rate of change of price i.e., <math>\frac{dP}{dt}</math> is half of the excess demand i.e. <math>(Q_d - Q_s)</math>.</p> <p>(i) Show that <math>\frac{dP}{dt} = \frac{1}{2} (20 - 5P)</math>.</p> <p>(ii) If <math>P = 2</math> when <math>t = 0</math>, then show that <math>P = 2 (2 - e^{-2.5t})</math></p> |   |
| 27.                                                                                                                                                                                                                                  | <p>A ₹1000 bond with a 4% coupon rate is 5 years until maturity and pays quarterly interest. If the annual market yield to maturity is 6%, what is the purchase price of the bond? [Given: <math>1.015^{-20} = 0.742</math>]</p>                                                                                                                                                                                                                         | 3 |
| 28(A).                                                                                                                                                                                                                               | <p>The overall increase in a company's market share was 33.1%. Management reports the growth rate as a CAGR of 8.5%. Assuming the CAGR is accurate, how many years did it take for the market share to grow this much? [Use <math>\log(1.331) = 0.124</math> and <math>\log(1.085) = 0.035</math>]</p>                                                                                                                                                   | 3 |

|                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |
|-----------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
|                                                                                                                       | <b>OR</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |          |
| <b>28(B).</b>                                                                                                         | A company needs to accumulate ₹ 45,000,000 in $n$ years to replace a fleet of vehicles. They decide to make annual deposits of ₹ 5,00,000 at the end of each year into a sinking fund. If the interest rate is 15% compounded annually, then in how many years will it take to reach the target?<br>[Use $\log(14.5) = 1.161$ and $\log(1.15) = 0.061$ ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |          |
| <b>29.</b>                                                                                                            | For the matrix $A = \begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix}$ , show that $A^3 - 7A - 6I = O$ , where $I$ is an identity matrix of order 2 and $O$ is a zero matrix of order $2 \times 2$ . Hence find $A^{-1}$ .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>3</b> |
| <b>30.</b>                                                                                                            | In an examination, 2000 students appeared and the mean of the normal distribution of marks is 30 with standard deviation as 6.25. Find how many students are expected to score:<br>(i) between 20 and 40 marks?<br>(ii) less than 25 marks?<br>[Use $P(0 \leq Z < 1.6) = 0.4452$ and $P(0 \leq Z \leq 0.8) = 0.2881$ ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>3</b> |
| <b>31.</b>                                                                                                            | A nutritionist claims that the average daily calorie intake of Indian teenagers is 2200 calories. To verify this claim, a random sample of 25 teenagers was selected, and their daily calorie intake was recorded. The sample mean was found to be 2080 calories with a sample standard deviation of 280 calories.<br><br>Test at the 5% level of significance whether the nutritionist's claim is valid. Assume that the calorie intake follows a normal distribution.<br>[Use $t_{24}(0.025) = 2.064$ ]                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>3</b> |
| <b>SECTION – D (4 x 5= 20)</b><br><b>This section comprises of 4 long answer (LA) type questions of 5 marks each.</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |          |
| <b>32.</b>                                                                                                            | Under monopoly, the quantity sold and market price are determined by demand function $p = 274 - x^2$ . If the marginal cost for a profit maximising monopolist is equal to $4 + 3x$ , find the consumer's surplus.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>5</b> |
| <b>33(A).</b>                                                                                                         | A textile factory manufactures three types of fabrics: Cotton (C), Silk (S), and Wool (W). These fabrics must pass through three processing units: Weaving ( $U_1$ ), Dyeing ( $U_2$ ), and Packaging ( $U_3$ ).<br>The per hour processing speeds of the units are as follows: <ul style="list-style-type: none"> <li>Unit <math>U_1</math> (Weaving): 20 units of Cotton, 40 units of Silk, 20 units of Wool.</li> <li>Unit <math>U_2</math> (Dyeing): 25 units of Cotton, 50 units of Silk, 50 units of Wool.</li> <li>Unit <math>U_3</math> (Packaging): 20 units of Cotton, 20 units of Silk, 40 units of Wool.</li> </ul> The total available processing time for the units are 20 hours for Weaving ( $U_1$ ), 12 hours for Dyeing ( $U_2$ ), and 19 hours for Packaging ( $U_3$ ).<br><br>Using Cramer's Rule, find the number of units of Cotton, Silk, and Wool that can be produced if the available time is fully utilized. | <b>5</b> |
|                                                                                                                       | <b>OR</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |          |

| 33(B). | <p>"Cyber-Safe" has upgraded their encryption protocol. They now use a more complex Encoding Matrix (E) to encrypt the 3-letter keyword that unlocks their central server. The encryption follows the formula: <math>C = E \cdot P</math>, where P is the column matrix of the letter positions (<math>A = 1, B = 2, C = 3, \dots, Z = 26</math>).</p> <p>You are an interceptor who has received an encrypted message matrix C and you have managed to crack the Encoding Matrix E.</p> <p>The Encoding matrix E is given as <math>E = \begin{bmatrix} 2 &amp; 1 &amp; 1 \\ 1 &amp; 0 &amp; 1 \\ 0 &amp; 2 &amp; 1 \end{bmatrix}</math></p> <p>The intercepted encrypted matrix C is given as <math>C = \begin{bmatrix} 52 \\ 36 \\ 35 \end{bmatrix}</math></p> <p>Using matrix algebra, determine the original numerical matrix P. Also decode the numbers into letters to reveal the 3-letter secret code word.</p> |      |                                |      |    |      |    |      |    |      |     |      |     |      |     |      |     |      |     |      |     |   |
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| 34.    | <p>A farmer can buy local goats at ₹400 each and hybrid goats at ₹600 each. A local goat produces milk worth ₹190 per week, while a hybrid goat produces milk worth ₹250 per week. The weekly maintenance cost of each goat is ₹60. The farmer has at most ₹12,000 to spend on buying goats and can maintain not more than 22 goats.</p> <p>Formulate the Linear Programming Problem and find how many local goats and hybrid goats the farmer should buy to maximize the weekly profit? Also, find the maximum profit.</p>                                                                                                                                                                                                                                                                                                                                                                                            | 5    |                                |      |    |      |    |      |    |      |     |      |     |      |     |      |     |      |     |      |     |   |
| 35(A). | <p>The following data represents the production of wheat in India (in Million Tonnes) over a period of 9 years. Due to climatic variations, the production fluctuates annually:</p> <table><tr><th>Year</th><th>Production (in Million Tonnes)</th></tr><tr><td>2015</td><td>86</td></tr><tr><td>2016</td><td>92</td></tr><tr><td>2017</td><td>98</td></tr><tr><td>2018</td><td>100</td></tr><tr><td>2019</td><td>103</td></tr><tr><td>2020</td><td>108</td></tr><tr><td>2021</td><td>109</td></tr><tr><td>2022</td><td>107</td></tr><tr><td>2023</td><td>110</td></tr></table> <p>Calculate the trend values using the 4-Year Centred Moving Average method for the given data.</p>                                                                                                                                                                                                                                   | Year | Production (in Million Tonnes) | 2015 | 86 | 2016 | 92 | 2017 | 98 | 2018 | 100 | 2019 | 103 | 2020 | 108 | 2021 | 109 | 2022 | 107 | 2023 | 110 | 5 |
| Year   | Production (in Million Tonnes)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |      |                                |      |    |      |    |      |    |      |     |      |     |      |     |      |     |      |     |      |     |   |
| 2015   | 86                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |      |                                |      |    |      |    |      |    |      |     |      |     |      |     |      |     |      |     |      |     |   |
| 2016   | 92                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |      |                                |      |    |      |    |      |    |      |     |      |     |      |     |      |     |      |     |      |     |   |
| 2017   | 98                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |      |                                |      |    |      |    |      |    |      |     |      |     |      |     |      |     |      |     |      |     |   |
| 2018   | 100                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |      |                                |      |    |      |    |      |    |      |     |      |     |      |     |      |     |      |     |      |     |   |
| 2019   | 103                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |      |                                |      |    |      |    |      |    |      |     |      |     |      |     |      |     |      |     |      |     |   |
| 2020   | 108                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |      |                                |      |    |      |    |      |    |      |     |      |     |      |     |      |     |      |     |      |     |   |
| 2021   | 109                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |      |                                |      |    |      |    |      |    |      |     |      |     |      |     |      |     |      |     |      |     |   |
| 2022   | 107                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |      |                                |      |    |      |    |      |    |      |     |      |     |      |     |      |     |      |     |      |     |   |
| 2023   | 110                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |      |                                |      |    |      |    |      |    |      |     |      |     |      |     |      |     |      |     |      |     |   |
| OR     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |      |                                |      |    |      |    |      |    |      |     |      |     |      |     |      |     |      |     |      |     |   |

|                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                  |      |      |      |       |      |      |                    |      |      |      |      |      |       |  |
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| 35(B).                                                                                                                                                                                                                                                                                                                                                                                            | <p>The "Digital India" initiative has led to a massive surge in digital payment transactions across the country. The following data represents the volume of digital transactions (UPI, NEFT, IMPS, debit card etc.) in India (in Crores) for 6 consecutive years. The growth has been significant due to the push for a digital economy.</p> <table><tr><td>Year</td><td>2018</td><td>2019</td><td>2020</td><td>2021</td><td>2022</td><td>2023</td></tr><tr><td>Volume (in crores)</td><td>2071</td><td>3134</td><td>4572</td><td>5554</td><td>8839</td><td>13462</td></tr></table> <p>(i) Fit a straight-line trend to the above data using the method of Least Squares.</p> <p>(ii) Estimate the likely volume of transactions for the year 2025, assuming the current trend continues.</p> | Year                                                                                                                             | 2018 | 2019 | 2020 | 2021  | 2022 | 2023 | Volume (in crores) | 2071 | 3134 | 4572 | 5554 | 8839 | 13462 |  |
| Year                                                                                                                                                                                                                                                                                                                                                                                              | 2018                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 2019                                                                                                                             | 2020 | 2021 | 2022 | 2023  |      |      |                    |      |      |      |      |      |       |  |
| Volume (in crores)                                                                                                                                                                                                                                                                                                                                                                                | 2071                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 3134                                                                                                                             | 4572 | 5554 | 8839 | 13462 |      |      |                    |      |      |      |      |      |       |  |
| <p style="text-align: center;"><b>SECTION – E</b> <span style="float: right;"><b>(3 x 4 = 12)</b></span></p> <p><b>This section comprises of 3 case-study/passage-based questions of 4 marks each with sub parts. The first two case study questions have three sub parts (i), (ii), (iii) of marks 1, 1, 2 respectively. The third case study question has two sub parts of 2 marks each</b></p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                  |      |      |      |       |      |      |                    |      |      |      |      |      |       |  |
| 36.                                                                                                                                                                                                                                                                                                                                                                                               | <p>Three pipes A, B and C can fill a tank in 12 hours, 15 hours and 20 hours respectively. Pipe A is kept open continuously. Pipes B and C in that order are open alternately for one hour each.</p> <div></div> <p>Based upon the above information, answer the following questions:</p> <p>(i) Find the part of the tank filled in one hour when pipes A and C are open together.</p> <p>(ii) Find the part of the tank filled in one hour when pipes A and B are open together.</p> <p>(iii) (A) Find the part of tank filled by the three pipes in the first 6 hours.</p> <p style="text-align: center;"><b>OR</b></p> <p>(iii) (B) Find the part of the unfilled tank at the end of 7 hours.</p>      | <p style="text-align: right;"><b>1</b></p> <p style="text-align: right;"><b>1</b></p> <p style="text-align: right;"><b>2</b></p> |      |      |      |       |      |      |                    |      |      |      |      |      |       |  |
| 37.                                                                                                                                                                                                                                                                                                                                                                                               | <p>The cost of building an office block, <math>x</math> floors high, consists of three components:</p> <ul style="list-style-type: none"><li>• ₹ 80 crores for the land</li><li>• ₹ 2 crores per floor</li><li>• Extra structural costs ₹ <math>(0.08x)</math> crores for each floor, where <math>x</math> is the total number of floors.</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                  |      |      |      |       |      |      |                    |      |      |      |      |      |       |  |

|            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                 |
|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|
|            | <p>Based on the above information, answer the following questions:</p> <p>(i) Find the total cost of building the office block <math>x</math> floors high.</p> <p>(ii) Find the average cost per floor in terms of <math>x</math>.</p> <p>(iii) (A) Find, how many floors the office block should have if the average cost per floor is to be minimized?</p> <p style="text-align: center;"><b>OR</b></p> <p>(iii) (B) Find, for how many floors the average cost keeps decreasing?</p> <p>[Use <math>\sqrt{10} = 3.2</math>]</p> | <p><b>1</b></p> <p><b>1</b></p> <p><b>2</b></p> |
| <b>38.</b> | <p>A couple wishes to purchase a house for ₹15,00,000 with a down payment of ₹4,00,000. If they amortize the balance at an interest rate of 9% per annum compounded monthly for 10 years.</p> <p>(i) Find the monthly installment using the flat rate method.</p> <p>(ii) Find the monthly installment using the reducing balance method.</p> <p>[Use <math>(1.0075)^{120} = 2.451</math> and <math>\frac{2.451}{1.451} = 1.69</math>]</p>                                                                                        | <p><b>2</b></p> <p><b>2</b></p>                 |