

**FIRST YEAR HIGHER SECONDARY EXAMINATION – DEC 2025**

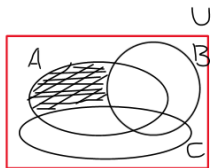
**PART – III**

**SUBJECT : MATHEMATICS SCIENCE (60)**

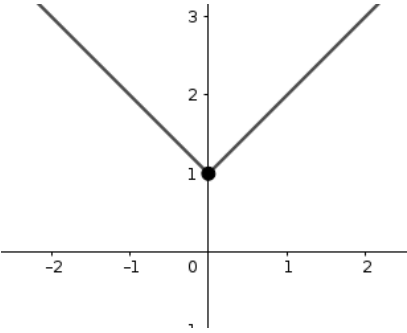
**CODE : FY – 3027**

**ANSWER KEY**

**2 : HOURS**

| Qn. No. | Sub. Qns. | Answer Key / Value Points                                                                                                    | Score | Total Score |
|---------|-----------|------------------------------------------------------------------------------------------------------------------------------|-------|-------------|
| 1       | i         | (d) A                                                                                                                        | 1     | 3           |
|         | ii        | (a) , (d)                                                                                                                    | 1     |             |
|         | iii       | <br>(Give full score for alternate figures) | 1     |             |
| 2       | i         | $R = \{(1, 7), (2, 5), (3, 5)\}$                                                                                             | 1     | 3           |
|         | ii        | Domain = $\{1, 2, 3\}$<br>Range = $\{5, 7\}$                                                                                 | 1     |             |
|         | iii       | (c) 1936                                                                                                                     | 1     |             |
| 3       | i         | (b) 0                                                                                                                        | 1     | 3           |
|         | ii        | $r = 1.5, \theta = \frac{4\pi}{3}$                                                                                           | 1     |             |
|         |           | $l = r\theta = 1.5 \times \frac{4\pi}{3} = 2\pi \text{ cm}$                                                                  | 1     |             |
| 4       | i         | $5 \times {}^5P_3 = 5 \times 5 \times 4 \times 3 = 300$                                                                      | 1     | 3           |
|         | ii        | $\frac{n(n-1)(n-2)(n-3)}{(n-1)(n-2)(n-3)(n-4)} = \frac{5}{3}$                                                                | 1     |             |
|         |           | $\frac{n}{n-4} = \frac{5}{3} ; 3n = 5n - 20 ; n = 10$                                                                        | 1     |             |

| Qn. No. | Sub. Qns. | Answer Key / Value Points                                                                                                                                                                                                                                                             | Score       | Total Score |
|---------|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------|
| 5       | i         | Let the terms are $\frac{a}{r^2}, \frac{a}{r}, a, ar, ar^2$ and $a = 4$<br>$\frac{a}{r^2} \times \frac{a}{r} \times a \times ar \times ar^2 = a^5 = 4^5 = 1024$                                                                                                                       | 1 ½         | 3           |
|         | ii        | $a = 2, r = 4, ar^{n-1} = 32768$<br>$2 \times r^{n-1} = 32768 ; 4^{n-1} = 16384$<br>$4^{n-1} = 4^7 ; n = 8$                                                                                                                                                                           | 1 ½         |             |
| 6       | i         | 0                                                                                                                                                                                                                                                                                     | 1           | 3           |
|         | ii        | Slope of the line passing through (1, 0) and (-4, 1) is $\frac{1}{-5}$<br>Slope of the required line is 5<br>Equation of the required line is $y - 5 = 5(x - -3)$<br>$5x - y + 20 = 0$                                                                                                | 1<br>1      |             |
| 7       | i         |                                                                                                                                                                                                                                                                                       | 1           | 3           |
|         | ii        | (d)<br>$x^2 + 9y = 0$<br>$x^2 = 4 \frac{9}{4} y ; a = \frac{9}{4}$<br>Focus = $(0, -\frac{9}{4})$ ; Directrix $y = \frac{9}{4}$                                                                                                                                                       | 1<br>1      |             |
| 8       |           | $n 2^{n-1} = 80 ; n = 5$<br>$\lim_{x \rightarrow 0^-} f(x) = \lim_{x \rightarrow 0^-} 2x + 3 = 3$<br>$\lim_{x \rightarrow 0^+} f(x) = \lim_{x \rightarrow 0^+} 3(x + 1) = 3 ; \lim_{x \rightarrow 0} f(x) = 3$<br>$\lim_{x \rightarrow 1} f(x) = \lim_{x \rightarrow 1} 3(x + 1) = 6$ | 1<br>1<br>1 | 3           |

| Qn. No. | Sub. Qns. | Answer Key / Value Points                                                                                                                                                                                          | Score | Total Score |
|---------|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------------|
| 9       | i         | ${}^5C_2 = 10$                                                                                                                                                                                                     | 1     | 4           |
|         | ii        | $A \cup B = \{1,2,3,4,6,8\}$                                                                                                                                                                                       | 1     |             |
|         |           | $(A \cup B)' = \{5,7,9\}$ $A' = \{5,6,7,8,9\}$ $B' = \{1,3,5,7,9\}$                                                                                                                                                | 1     |             |
|         |           | $A' \cap B' = \{5,7,9\}$<br>$(A \cup B)' = A' \cap B'$                                                                                                                                                             | 1     |             |
| 10      | i         | $f(1) = a + b = 1$ ; $f(0) = b = -1$ Solving, $a = 2$                                                                                                                                                              | 1     | 4           |
|         | ii        |                                                                                                                                   | 1     |             |
|         |           | Range = $[1, \infty)$                                                                                                                                                                                              | 1     |             |
|         |           |                                                                                                                                                                                                                    | 1     |             |
| 11      | i         | (d) $y$ - axis ; $z = \frac{1-i}{1+i} = \frac{(1-i)(1-i)}{(1+i)(1-i)} = \frac{1-2i+i^2}{2} = -i$                                                                                                                   | 1     | 4           |
|         | ii        | $\left  \frac{z_1 z_2}{\bar{z}_1} \right  = \frac{ z_1   z_2 }{ \bar{z}_1 } = \frac{\sqrt{5}\sqrt{5}}{\sqrt{5}} = \sqrt{5}$                                                                                        | 2     |             |
|         |           | [Since, $ z_1  = \sqrt{5}$ , $ z_2  = \sqrt{5}$ , $ \bar{z}_1  = \sqrt{5}$ ]                                                                                                                                       | 1     |             |
| 12      |           | $\frac{x+11}{x-3} > 0$ , for real $x$ ;<br>$x + 11 > 0$ and $x - 3 > 0$ or $x + 11 < 0$ and $x - 3 < 0$<br>$x > -11$ & $x > 3$ or $x < -11$ & $x < 3$<br>Combining we get, $x \in (-\infty, -11) \cup (3, \infty)$ | 4     | 4           |
| 13      | i         | $2^n$                                                                                                                                                                                                              | 1     |             |

| Qn. No. | Sub. Qns. | Answer Key / Vdخالuxe Points                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Score                                                                                                               | Total Score |
|---------|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|-------------|
| 13      | ii        | ${}^5C_0 \left(\frac{2}{x}\right)^5 - {}^5C_0 \left(\frac{2}{x}\right)^4 \left(\frac{x}{2}\right)^1 + {}^5C_0 \left(\frac{2}{x}\right)^3 \left(\frac{x}{2}\right)^2 - {}^5C_0 \left(\frac{2}{x}\right)^2 \left(\frac{x}{2}\right)^3 + {}^5C_0 \left(\frac{2}{x}\right)^1 \left(\frac{x}{2}\right)^4 - + {}^5C_0 \left(\frac{2}{x}\right)^5$ $= \frac{32}{x^5} - \frac{40}{x^3} + \frac{20}{x} - \frac{10x}{2} + \frac{5x^3}{8} + \frac{x^5}{32}$                                                                                                                                            | 1<br>1<br>1                                                                                                         | 4           |
| 14      |           | $a + ar + ar^2 = 16 \quad ; a[1 + r + r^2] = 16 \text{ -----} \rightarrow (1)$<br>$ar^3 + ar^4 + ar^5 = 128 \quad ; ar^3[1 + r + r^2] = 128 \rightarrow (2)$<br>Solving, $r^3 = \frac{128}{16} = 8 \quad ; r = 2 \quad ;$<br>$1 + r + r^2 = 1 + 2 + 4 = 7 \quad ; a = \frac{16}{7}$<br>$S_n = \frac{16}{7}(2^n - 1)$                                                                                                                                                                                                                                                                        | 1<br>1<br>1<br>1                                                                                                    | 4           |
| 15      |           | Given line $\sqrt{3}x + y = 1 \quad ; y = -\sqrt{3}x - 1 \quad ; \text{Slope } m_1 = -\sqrt{3}$<br>$\theta = 60^\circ \therefore \tan \theta = \sqrt{3}$<br>$\frac{m_2 + \sqrt{3}}{1 - \sqrt{3}m_2} = \pm \sqrt{3} \quad ; m_2 + \sqrt{3} = \sqrt{3} - 3m_2 \text{ or}$<br>$m_2 + \sqrt{3} = -\sqrt{3} + 3m_2$<br>$m_2 + 3m_2 = 0 \quad ; m_2 = 0$<br>$-2m_2 = -2\sqrt{3} \quad ; m_2 = \sqrt{3}$<br>Equation of the required line is $y = -2$ or<br>Equation of the required line is $y + 2 = \sqrt{3}(x - 3)$<br>$y = 2 = \sqrt{3}x - 3\sqrt{3}$<br>$\sqrt{3}x - y - (2 + 3\sqrt{3}) = 0$ | $\frac{1}{2}$<br>$\frac{1}{2}$<br>$\frac{1}{2}$<br>$\frac{1}{2}$<br>$\frac{1}{2}$<br>$\frac{1}{2}$<br>$\frac{1}{2}$ | 4           |

| Qn. No. | Sub. Qns. | Answer Key / Value Points                                                                                              | Score | Total Score |
|---------|-----------|------------------------------------------------------------------------------------------------------------------------|-------|-------------|
| 16      | i         | $a$                                                                                                                    | 1     | 4           |
|         | ii        | XOYZ                                                                                                                   | 1     |             |
|         | iii       | Z - coordinate                                                                                                         | 1     |             |
|         | iv        | (6, 0, 8)                                                                                                              | 1     |             |
|         |           |                                                                                                                        |       |             |
| 17      | i         | $2\cos^2 \frac{x}{2} = 1 + \cos x = 1 + \frac{4}{5} = \frac{1}{5}$                                                     | 1     | 6           |
|         | ii        | $\cos \frac{x}{2} = \pm \frac{1}{\sqrt{10}}, 0 \leq x \leq \pi ; \cos \frac{x}{2} = \frac{1}{\sqrt{10}}$               | 1     |             |
|         |           | $\cos 24^\circ + \cos 204^\circ + \cos 55^\circ + \cos 125^\circ + \cos 300^\circ =$                                   | 1     |             |
|         |           | $\cos 24^\circ + \cos(180 + 24)^\circ + \cos 55^\circ + \cos(180 - 55)^\circ +$                                        | 1     |             |
|         |           | $\cos(360 - 60)^\circ$                                                                                                 |       |             |
| 18      |           | $= \cos 24^\circ - \cos 24^\circ + \cos 55^\circ - \cos 55^\circ + \cos 60^\circ = \frac{1}{2}$                        | 1     | 6           |
|         | iii       | $\frac{\sin x - \sin 3x}{\sin^2 x - \cos^2 x} = \frac{-2 \cos 2x \sin x}{-\cos 2x} = 2 \sin x$                         | 1     |             |
|         | i         | ${}^5C_4 \times {}^{12}C_7 = 5 \times 1320 = 6600$                                                                     | 2     |             |
|         | ii        | ${}^4C_1 \times {}^{48}C_4 = 4 \times 194580 = 778320$                                                                 | 2     |             |
|         | iii       | Number of arrangement $= \frac{8!}{4! \times 2!} \times \frac{6!}{3! \times 2!} = 50400$                               | 2     |             |
| 19      |           | Comparing, $a = 2, b = \sqrt{\frac{36}{5}} ; c = \sqrt{\frac{56}{5}}$ $foci = \left(0, \pm \sqrt{\frac{56}{5}}\right)$ | 1     |             |
|         |           |                                                                                                                        | 1     |             |
|         |           | Vertices $= (0, \pm 2) ;$ Eccentricity $e = \frac{\sqrt{\frac{56}{5}}}{2}, LR = \frac{36}{5}$                          | 1     |             |

| Qn. No. | Sub. Qns.          | Answer Key / Value Points                                                                                                                                                                                                                                                                                                                                                                                                          | Score                      | Total Score |
|---------|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|-------------|
| 19      |                    | <p>We have for an ellipse, <math>b^2 = a^2 - c^2</math> ; <math>c = ae</math></p> <p>From the given data, <math>2c = \frac{b^2}{a}</math></p> <p><math>2ae = \frac{a^2 - a^2 e^2}{a}</math> ; <math>2e = 1 - e^2</math> ; <math>e^2 + 2e - 1 = 0</math></p> <p>Solving, <math>e = \sqrt{2} - 1</math> (<math>0 &lt; e &lt; 1</math>)</p>                                                                                           | <p>1</p> <p>1</p> <p>1</p> | 6           |
| 20      | <p>i</p> <p>ii</p> | <p><math>y = \frac{a}{x^4} - \frac{b}{x^4} + \cos x</math></p> <p><math>\frac{dy}{dx} = \frac{-4a}{x^5} + \frac{2b}{x^3} - \sin x</math></p> <p><math>y = \frac{x^5 - \cos x}{\sin x}</math></p> <p><math>\frac{dy}{dx} = \frac{\sin x (5x^4 + \sin x) - (x^5 - \cos x) \cos x}{\sin^2 x}</math></p> <p><math>y = \frac{3}{x^4} - \frac{4}{x^9}</math></p> <p><math>\frac{dy}{dx} = \frac{-12}{x^5} + \frac{36}{x^{10}}</math></p> | <p>2</p> <p>2</p> <p>2</p> | 6           |

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**PREPARED BY LAL E V, GOVT. HSS KUTTIPPURAM**