DIRECTORATE OF GOVERNMENT EXAMINATIONS, CHENNAI – 600 006

HSE FIRST YEAR EXAMINATION – MARCH-2025

MATHEMATICS MARKING SCHEME – ENGLISH MEDIUM

MAXIMUM MARKS :90

GENERAL INSTRUCTIONS

1. The answers given in the marking scheme are Textbook and Solutionbook bound.
2. If a student has given any answer which is different from one given in the marking scheme, but carries the prescribed content meaning (rigorous) such answers should be given full credit with suitable distribution.
3. Follow the footnotes which are given under certain answer schemes.
4. If a particular stage is wrong and if the candidate writes the appropriate formula then award 1 mark & 2 Marks for the formulae (for the stage mark 2* & 3*). This mark (*) is attached with that stage. This is done with the aim that a student who did the problem correctly without writing the formulae should not be penalized.
5. In the case of Part II, Part III and Part IV, if the solution is correct then award full mark directly. The stage mark is essential only if the part of the solution is incorrect.
6. Answers written only in Black or Blue ink should be evaluated.

PART – I

Note : One mark to write the correct option and the corresponding answer. 20×1=20

TYPE A			TYPE B		
Q.No	**OPTION**	**ANSWER**	**Q.NO**	**OPTION**	**ANSWER**
1.	(d)	$[2, \infty)$	1.	(d)	$\mathrm{P}(\mathrm{A} \cap \bar{B}) + \mathrm{P}(\bar{A} \cap B)$
2.	(b)	6	2.	(c)	3
3.	(c)	$n(n+1)$	3.	(d)	$[2, \infty)$
4.	(a)	$y = e^x$	4.	(c)	$n(n+1)$
5.	(c)	3	5.	(a)	512
6.	(a)	Right triangle	6.	(c)	$\frac{10}{21}$
7.	(d)	5^5	7.	(a)	Value does not exist
8.	(d)	$90°$	8.	(b)	6
9.	(a)	6	9.	(d)	7
10.	(a)	$-\frac{1}{\log 3}$	10.	(a)	Right triangle
11.	(d)	$\frac{1}{90} cosx°$	11.	(d)	5^5
12.	(c)	$\frac{2^{3x+5}}{3log2} + c$	12.	(b)	$4\mathrm{x} - 3\mathrm{y} - 7 = 0$
13.	(a)	$\alpha + 3\beta = 11$	13.	(c)	$\frac{2^{3x+5}}{3log2} + c$
14.	(d)	$\mathrm{P}(\mathrm{A} \cap \bar{B}) + \mathrm{P}(\bar{A} \cap B)$	14.	(a)	$y = e^x$
15.	(a)	512	15.	(a)	$\alpha + 3\beta = 11$
16.	(a)	value does not exist	16.	(d)	$90°$
17.	(b)	$\frac{\mathrm{k}^3}{\sqrt{2}}$	17.	(a)	$-\frac{1}{\log 3}$
18.	(b)	$4\mathrm{x} - 3\mathrm{y} - 7 = 0$	18.	(b)	$\frac{\mathrm{k}^3}{\sqrt{2}}$
19.	(d)	7	19.	(d)	$\frac{1}{90} cosx°$
20.	(c)	$\frac{10}{21}$	20.	(a)	6

PART – II

Answer any **SEVEN** questions. Question No.**30** is compulsory. 7×2=14

Q.NO	CONTENT	MARKS
21.	$\overrightarrow{PQ} = \overrightarrow{QR}$	1
	The points P, Q, R are collinear	1
22.	$P(A) + P(B) + P(C) + P(D) = 1$	1
	Permissible.	1
23.	$\frac{dy}{dx} = e^{sinx}\, cosx$	2*
24.	$n\, 2^{n-1} = 12$	1
	$n = 3$	1
25.	$A = \frac{1}{2}\begin{bmatrix} 1 & 9 & 25 \\ 0 & 4 & 16 \end{bmatrix}$ (Each Correct Row 1 Mark)	2
26.	$= 3x \begin{vmatrix} 2 & 3 & 4 \\ 5 & 6 & 8 \\ 2 & 3 & 4 \end{vmatrix}$	1
	$= 0$	1
27.	$x = 1,2,3,4.$	1
	$x = \cdots -3, -2, -1,0,1,2,3,4.$	1
28.	$2,2,4,4,6,6.$	2
29.	$h = 9cos\alpha\,, \quad k = 9sin\alpha$	1
	$x^2 + y^2 = 81$	1
30.	$3! = 6, \quad 4! = 24$	1
	(The unit digit of $5! + \cdots + 20!$ is 0)	
	unit digit $= 0$	1

Important Note for Part – III and Part – IV

In an answer to a question, between any two particular stages of marks (greater than one) if a student starts from a stage with correct step but reaches the next stage with a wrong result then suitable credits should be given to the related steps instead of denying the entire marks meant for the stage.

PART – III

Answer any **SEVEN** questions. Question No.**40** is compulsory. 7×3=21

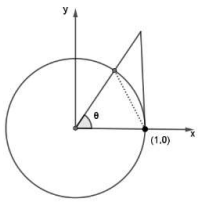
Q.NO	CONTENT	MARKS
31.	$-1 \leq \cos x \leq 1$ Range is $\left(-\infty, -\frac{1}{2}\right] \cup \left[\frac{1}{4}, \infty\right)$	1 2
32.	$x^2 - x - 2 = (x+1)^2$ $x = -1$	1 2
33.	$\sin(45° + \theta) - \sin(45° - \theta) = 2cos45°sin\theta$ $= \sqrt{2}sin\theta$	2* 1
34.	$(n+2)(n+1)n(n-1) = 42 \times n(n-1)$ $n = 5$	2* 1
35.	$102^4 = (100+2)^4$ $= 108243216$	1 2*
36.	slope of $AB = \frac{1}{2}$ slope of $BC = \frac{1}{2}$ They are Collinear (or) Any other alternative method	1 1 1
37.	$\vec{a} = \lambda(\vec{b} \times \vec{c})$ *(or)* $\vec{a} = \pm\lambda(\vec{b} \times \vec{c})$ $\lambda = \pm\frac{2}{\sqrt{3}}$ *(or)* $\lambda = \frac{2}{\sqrt{3}}$ $\vec{a} = \pm\frac{2}{\sqrt{3}}(\vec{b} \times \vec{c})$	1 1 1

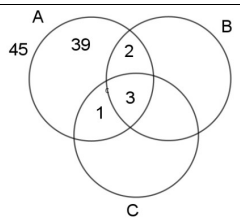
38.	$= \frac{1}{2}\int (sin8x - sin2x)dx$ $= \frac{1}{2}\left(-\frac{\cos 8x}{8} + \frac{\cos 2x}{2}\right) + c$	2* 1
39.	$n(S) = 2^8 \ (or)\ 256$ (i) $P(A) = \frac{7}{64}$ (ii) $P(B) = \frac{37}{256}$	1 1 1
40.	$y = \cos^{-1}(cos2x)$ $\frac{dy}{dx} = 2$ (or) Any other equivalent form of $\frac{dy}{dx}$	1 2*

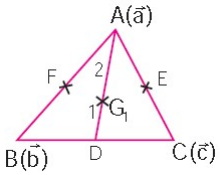
PART – IV

Answer **all** the Questions:- 7×5=35

Q.NO	CONTENT	MARKS
41.(a)	$\frac{x^2+x+1}{x^2-5x+6} = 1 + \frac{6x-5}{x^2-5x+6}$ $\frac{6x-5}{x^2-5x+6} = \frac{A}{(x-2)} + \frac{B}{(x-3)}$ $A = -7 \quad , \quad B = 13$ $\frac{x^2+x+1}{x^2-5x+6} = 1 + \frac{-7}{(x-2)} + \frac{13}{(x-3)}$	1 1 1+1 1
	(OR)	
41.(b)	(i) $y = \sqrt{3}x + 4$ (ii) $\frac{x}{-4/\sqrt{3}} + \frac{y}{4} = 1$ (iii) $p = 2\,, \quad \alpha = \frac{5\pi}{6}$ $x\cos\frac{5\pi}{6} + y\sin\frac{5\pi}{6} = 2$	1 1 1 2*

42.(a)	$= \dfrac{\cot\theta \, cos\theta cos\theta}{-cos\theta(-tan\theta)\,\mathrm{cosec}\,\theta}$ $= cos^2\theta cot\theta$	3 2
	(OR)	
42.(b)	$\left(\sqrt{1-x^2}\right)y = sin^{-1}x$ $(1-x^2)y_1 - xy = 1$ $(1-x^2)y_2 - 3xy_1 - y = 0$	1 2 2
43.(a)	 Rough Diagram $\frac{tan\theta}{2} \geq \frac{\theta}{2} \geq \frac{sin\theta}{2}$ $cos\theta \leq \dfrac{sin\theta}{\theta} \leq 1$ $\lim\limits_{\theta\to 0} \dfrac{sin\theta}{\theta} = 1$ (or) Any other alternative method	1 2 1 1
	(OR)	
43.(b)	$P(A_1) = \frac{60}{100}$, $P(B/A_1) = \frac{2}{100}$, $P(A_2) = \frac{40}{100}$,$P(B/A_2) = \frac{4}{100}$ $P(B) = \dfrac{60}{100} \times \dfrac{2}{100} + \dfrac{40}{100} \times \dfrac{4}{100}$ $= \frac{28}{1000}\ (or) 0.028$	2 2* 1
44.(a)	$\sqrt[3]{x^3+7} - \sqrt[3]{x^3+4} = (x^3+7)^{\frac{1}{3}} - (x^3+4)^{\frac{1}{3}}$ $= x\left(1+\dfrac{7}{x^3}\right)^{\frac{1}{3}} - x\left(1+\dfrac{4}{x^3}\right)^{\frac{1}{3}}$ $= x(1 + \dfrac{7}{3x^3} + \cdots - 1 - \dfrac{4}{3x^3} - \cdots)$ $= \frac{1}{x^2}$(approx.)	1 1 1 2
	(OR)	

44.(b)	$kx^2 - x(2k+5) + (k+7) = 0$	1
	$\alpha + 2\alpha = \frac{2k+5}{k}$	1
	$\alpha\,(2\alpha) = \frac{k+7}{k}$	1
	$k = 2\ (or)\ k = -25$	2
45.(a)	$LHS = tan60°\,(tan20°\tan 40°\tan 80°)$	1
	$= tan60°tan60°$	2*
	$= 3$	2
	(OR)	
45.(b)	$I = \int \frac{1}{\sqrt{\left(x+\frac{5}{2}\right)^2 - \left(\frac{3}{2}\right)^2}} dx$	2
	$= \log\left\lvert\left(x+\frac{5}{2}\right) + \sqrt{\left(x+\frac{5}{2}\right)^2 - \left(\frac{3}{2}\right)^2}\right\rvert + c$	3*
46.(a)	 Rough Diagram	2
	No. of persons who know only language A $= 5000 \times \frac{39}{100}$	2
	$= 1950$	1
	(or) Any other alternative method	
	(OR)	

46.(b)	 Rough Diagram	1
	$\overrightarrow{OD} = \frac{\vec{b}+\vec{c}}{2}$, $\overrightarrow{OE} = \frac{\vec{a}+\vec{c}}{2}$, $\overrightarrow{OF} = \frac{\vec{a}+\vec{b}}{2}$	1
	$\overrightarrow{OG_1} = \frac{\vec{a}+\vec{b}+\vec{c}}{3}$	1
	$\overrightarrow{OG_2} = \frac{\vec{a}+\vec{b}+\vec{c}}{3}$, $\overrightarrow{OG_3} = \frac{\vec{a}+\vec{b}+\vec{c}}{3}$	1
	The medians of a triangle are concurrent	1
	(One can prove without diagram award full mark)	
47.(a)	P(1) is true	1
	assume P(k) is true	1
	To prove P(k+1) is true	2
	conclusion	1
	(OR)	
47.(b)	$= \begin{vmatrix} 1+a & -a & -a \\ 1 & b & 0 \\ 1 & 0 & c \end{vmatrix}$	2
	$= bc + abc + ac + ab$	1
	$= abc\left(1+\frac{1}{a}+\frac{1}{b}+\frac{1}{c}\right)$	2
	(or) (Any other alternative method)	