DEPARTMENT OF GOVERNMENT EXAMINATIONS, CHENNAI - 600 006.

HSE SECOND YEAR EXAMINATION – MARCH 2025

MATHEMATICS KEY ANSWER

Maximum Marks - 90

GENERAL INSTRUCTIONS

1. The answers given in the marking scheme are taken from TEXT BOOK 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 foot notes 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 for the formula (for 2^{*}). This mark is attached with that stage. This is done with the aim that a student who did the problem correctly without writing the formula should not be penalized.

5. In the case of part II, III and 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 Blue or Black ink should be evaluated.

PART I

One mark to write the correct option and the corresponding answer.

Note- All questions are compulsory **20×1=20**

CODE - A			CODE - B		
Q.No	Option	Answer	Q.No	Option	Answer
1	**a**	N	**1**	**b**	$\frac{1}{\sqrt{2}}$
2	**d**	2	**2**	**a**	π
3	**d**	$\frac{1}{5}$	**3**	**d**	2xu
4	**d**	2.5	**4**	**a**	N
5	**a**	1,2	**5**	**d**	$\frac{1}{5}$
6	**a**	19	**6**	**a**	(1,0)
7	**b**	$y = x^3 + 2$	**7**	**d**	2.5
8	**b**	[1,2]	**8**	**b**	$\frac{1}{f(x)} f'(x)\, dx$
9	**d**	2xu	**9**	**b**	[1,2]
10	Mere Attempt		**10**	**d**	2
11	**b**	$\pm\frac{1}{\sqrt{2}}(1+i)$	**11**	**c**	$\frac{\pi a^3}{6}$
12	**b**	$1+i$	**12**	**a**	1,2
13	**d**	0.25	**13**	**b**	$\frac{\pi}{6}$
14	**c**	$\frac{\pi}{2}$	**14**	**a**	19
15	**a**	(1,0)	**15**	**b**	$1+i$
16	**b**	$\frac{\pi}{6}$	**16**	**c**	$\frac{\pi}{2}$
17	**c**	$\frac{\pi a^3}{6}$	**17**	**b**	$\pm\frac{1}{\sqrt{2}}(1+i)$
18	**b**	$\frac{1}{\sqrt{2}}$	**18**	**b**	$y = x^3 + 2$
19	**a**	π	**19**	**d**	0.25
20	**b**	$\frac{1}{f(x)} f'(x)\, dx$	**20**	Mere Attempt	

Important Note for Part II, 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 II

Note : For Part II, III and IV award full mark for correct alternate method.
Answer Any Seven Questions. Question No 30 is Compulsory

7×2=14

21	$A^{-1} = \pm\frac{1}{3}\begin{bmatrix} -1 & 2 & 2 \\ 1 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$	2*
22	$\frac{1}{Z} = \frac{1}{x+iy}$ $\text{Re}\left(\frac{1}{Z}\right) = \frac{x}{x^2+y^2}$	1 1
23	$\tan^{-1}(-\sqrt{3}) = -\frac{\pi}{3}$	2*
24	$c^2 = a^2(1+m^2)$ $c = \pm\sqrt{153}$ (or) $c = \pm 3\sqrt{17}$	2*
25	$y = x - 11$ *is slant asymptote*	2*
26	$F(\lambda x, \lambda y) = \lambda F(x, y)$ F is homogeneous function of degree : **1**	1 1
27	$\frac{dy}{\sqrt{1-y^2}} = \frac{dx}{\sqrt{1-x^2}}$ $\text{Sin}^{-1}y = \text{Sin}^{-1}x + c$	1 1
28	$\int_{-\infty}^{\infty} f(x)dx = 1$ $C = \frac{1}{21}$	2*
29	Another root = **–2–**i $x^2 + 4x + 5 = 0$	1 1
30	$\int_0^{2a} f(x)dx = 2\int_0^a f(x)dx : f(2a-x) = f(x)$ $\int_0^{\pi} f(x)dx = 2\int_0^{\frac{\pi}{2}} f(x)dx$ (Any other alternative method)	2*

Note : If a particular stage is wrong and if the candidate writes the appropriate formula then award 1 mark for the formula (for 2^*). This mark is attached with that stage. This is done with the aim that a student who did the problem correctly without writing the formula should not be penalized.

PART III

Answer Any Seven Questions. Question No 40 is Compulsory :

7×3=21

31	$\begin{bmatrix}2 & 5\\ 1 & 2\end{bmatrix}\begin{pmatrix}x\\ y\end{pmatrix}=\begin{pmatrix}-2\\ -3\end{pmatrix}$ $A^{-1}=\begin{bmatrix}-2 & 5\\ 1 & -2\end{bmatrix}$ X= -11, y=4	1 1 1
32	$\lvert 6+8i\rvert = 10$ $8 \le \lceil z+6+8i \rceil \le 12$	1 2*
33	$7x^3$-$43x^2$-43x+7=0 Roots are : $-1, 7, \frac{1}{7}$	1 2*
34	$tan^{-1}\frac{2}{11}+tan^{-1}\frac{7}{24}=tan^{-1}\left[\frac{\frac{2}{11}+\frac{7}{24}}{1-\frac{2}{11}\times\frac{7}{24}}\right]$ $tan^{-1}\frac{2}{11}+tan^{-1}\frac{7}{24}=tan^{-1}\frac{1}{2}$	2* 1
35	$\left[\vec{a}+\vec{c}\,,\vec{a}+\vec{b},\vec{a}+\vec{b}\,+\vec{c}\right]=\begin{vmatrix}1 & 0 & 1\\ 1 & 1 & 0\\ 1 & 1 & 1\end{vmatrix}\left[\vec{a}\,\vec{b}\,\vec{c}\right]$ $=\left[\vec{a}\,\vec{b}\,\vec{c}\right]$	2* 1
36	$\frac{du}{dt}=(2xy+3y^4)(e^t)+(x^2+12xy^3)$ (cost) $=e^t\ [2e^t\ sint+3sin^4\,t+e^t\,cost+12sin^3\,tcost]$ (or) equivalent answer	2* 1
37	$I=\int_0^{\frac{\pi}{2}}\frac{sec^2x}{6+tan^2x}\,dx$ I = $\frac{\pi}{2\sqrt{6}}$	1 2*

38	E (x) = $\frac{3}{2}$ Expected loss Rs. 0.50	2* 1
39	$f(x) = f(2) + \frac{f'((2)}{1!}(x-2) + \cdots .. + \frac{f^n(2)}{n!}(x-2)^n + \cdots$ $= 13 + \frac{14}{1!}(x-2) + \frac{12}{2!}(x-2)^2 + \frac{6}{3!}(x-2)^3$	2* 1
40	$\frac{3}{2} + m - \frac{3m}{2} + 7 = \frac{87}{10}$ $m = \frac{-2}{5}$	2* 1

Note : If a particular stage is wrong and if the candidate writes the appropriate formula then award 1 mark for the formula (for 2*). This mark is attached with that stage. This is done with the aim that a student who did the problem correctly without writing the formula should not be penalized.

Part – IV

Answer all the Questions :- **7×5=35**

41(a)	$\Delta = 6$ $\Delta_1 = 12$ $\Delta_2 = -6$ $\Delta_3 = 24$ $(x_1, x_2, x_3) = (2, -1, 4)$ **(or)**	1 1 1 1 1
41(b)	$\frac{dy}{dx} = -\frac{2cost}{7sint}$ Equation of tangent 2x cost+7y sint=14 Equation of normal 7x sint-2y cost = 45 sint cost	1 2* 2*
42(a)	$(z-1))^3 = -8$ $(1-z) = 2(1)^{\frac{1}{3}}$ (or) $(z-1) = -2(1)^{\frac{1}{3}}$ $(1-z) = 2\,(1, \omega, \omega^2)$ $z = -1, 1-2\,\omega, 1-2\,\omega^2$ **(or)**	1 1 1 2

42(b)	Rough diagram Area=$\int_{-1}^{2}(y+2-y^2)dy$ $= \frac{9}{2}$	1 2* 2*
43(a)	Another root is :**3** Corresponding factor is :$3x^2 - 10x + 3$ Another factor is :$2x^2 + 5x + 2$ Roots are: $\frac{1}{3}, 3, \frac{-1}{2}, -2$ (Any other alternative method) **(or)**	1 1 2 1
43(b)	$\frac{dy}{dx} = \frac{x^2 - 3y^2}{2xy}$ $y = vx$ $v + x\frac{dv}{dx} = \frac{-(1-3v^2)}{2v}$ $y^2 - x^2 = cx^3$	1 1 1 2*
44(a)	Rough diagram $x^2 = -4ay$ $4a = \frac{225}{10}$ Height of arch is = **10 –1.6 = 8.4**m **(or)**	1 1 1 2*
44(b)	Rough diagram $\hat{a} = cos\alpha\hat{l} + sin\alpha\hat{j}$ $\hat{b} = cos\beta\hat{l} + sin\beta\hat{j}$ $\hat{a}.\hat{b} = \cos(\alpha - \beta)$ $\hat{a}.\hat{b} = \cos\alpha\cos\beta + sin\alpha\, sin\beta$ $\cos(\alpha - \beta) = \cos\alpha\cos\beta + sin\alpha\, sin\beta$	1 1 1 1 1

45(a)	$n = 6, p = \frac{8}{9}, q = \frac{1}{9}$ $p(x = 3) = 6c_3 \left(\frac{8}{9}\right)^3 \left(\frac{1}{9}\right)^3$ $p(x = 0) = \left(\frac{8}{9}\right)^4$ **(or)**	1 2* 2*
45(b)	$2c = 4$ (or) $F_1 F_2 = 4$ (or) $2ae = 4$ $\frac{2b^2}{a} = 6$ centre : (0,1) $\frac{x^2}{16} + \frac{(y-1)^2}{12} = 1$	1 1 1 2*
46(a)	$\vec{a} = \hat{j} - 5\hat{k}$ $\vec{b} = 2\hat{\imath} + 3\hat{j} + 6\hat{k}$ $\vec{c} = \hat{\imath} + \hat{j} - \hat{k}$ Non parametric vector equation : $\vec{r}.(9\hat{\imath} - 8\hat{j} + \hat{k}) + 13 = 0$ Cartesian equation $9x - 8y + z + 13 = 0$ **(or)**	1 2* 2*
46(b)	A = ce^{kt} c = A_0 k = $\frac{1}{50}(log2)$ t =50 $\left(\frac{\log}{\log 2}\right)$	2 1 1 1
47(a)	Rough diagram $v' = \frac{\pi b}{a}(2ar - 3r^2)$ $r = \frac{2a}{3}$ $v'' = \frac{\pi b}{a}(2a - 6r)$ volume of cylinder= $\frac{4}{9}$ (volume of cone) **(or)**	1 1 1 1 1

47(b)

p	q	r	q∨r	p∧(q∨r)	p∧q	p∧r	(p∧q) ∨(p∧r)
T	T	T	T	T	T	T	T
T	T	F	T	T	T	F	T
T	F	T	T	T	F	T	T
T	F	F	F	F	F	F	F
F	T	T	T	F	F	F	F
F	T	F	T	F	F	F	F
F	F	T	T	F	F	F	F
F	F	F	F	F	F	F	F

2+1+1

(2) (1) (1)

$p \wedge (q \vee r) \equiv (p \wedge q) \vee (p \wedge r)$ 1

Note :

i) The order of rows and columns need not be same as in the scheme

ii) If any mistake in the table then award two marks for the table

Note : If a particular stage is wrong and if the candidate writes the appropriate formula then award 1 mark for the formula (for 2^{*}). This mark is attached with that stage. This is done with the aim that a student who did the problem correctly without writing the formula should not be penalized.