Mgn/dgl/2024/+2/maths key

CODE A			CODE B		
Q.No.	Option	Answer	Q.No.	Option	Answer
1	(a)	8/3	1	(a)	45°
2	(d)	$\frac{3\pi a^4}{16}$	2	(d)	8
3	(a)	10	3	(a)	8/3
4	(d)	2	4	(a)	10
5	(d)	8	5	(d)	$\frac{1}{\sqrt{5}}$
6	(a)	$[\vec{\alpha}, \vec{\beta}, \vec{\gamma}] = 0$	6	(c)	-4
7	(d)	$\frac{dy}{dx^2}$	7	(d)	adj (AB) = (adj A)
8			8		16
9			9	(d)	adj (AB) = (adj A)
10			10		$\frac{d^2y}{dx^2} - y$
11	(d)	Parabola	11	(c)	2
12			12		

[redacted] Students Happy Grace Marks

Mgn/dgl/2024/+2/maths key

12th Maths

Public Exam

Official Answer Key 2024

DEPARTMENT OF GOVERNMENT EXAMINATIONS CHENNAI 600006

HIGHER SECONDARY SECOND YEAR EXAMINATION MARCH 2024

MATHEMATICS MARKING SCHEME –ENGLISH MEDIUM

1. The answers given in the marking scheme are based on NEW TEXT BOOK and SOLUTION BOOK issued on 2023.
2. If a student has given any answer which is different from one given in the marking scheme, but carries 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 for the formula (for the stage mark 2*). This mark (*) is attached with that stage. This 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, 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.

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CODE A			CODE B		
Q.No.	Option	Answer	Q.No.	Option	Answer
1	(a)	$8/3$	1	(a)	45°
2	(d)	$\frac{3\pi a^4}{16}$	2	(d)	8
3	(a)	10	3	(a)	$8/3$
4	(d)	2	4	(a)	10
5	(d)	8	5	(d)	$\frac{1}{\sqrt{5}}$
6	(a)	$[\vec{\alpha}, \vec{\beta}, \vec{\gamma}] = 0$	6	(c)	-4
7	(d)	$\frac{d^2y}{dx^2} - y = 0$	7	(b)	$-\frac{q}{r}$
8	(b)	y=0	8	(d)	$\frac{3\pi a^4}{16}$
9	(d)	$\frac{1}{(x+1)^2}dx$	9	(d)	adj (AB) = (adj A) (adj B)
10	(a)	$x^2 + y^2$	10	(a)	$[\vec{\alpha}, \vec{\beta}, \vec{\gamma}] = 0$
11	(c)	2	11	(d)	$\frac{d^2y}{dx^2} - y = 0$
12	(d)	Parabola	12	(c)	2
13	(c)	$\begin{bmatrix} 5 & -2 \\ 3 & -1 \end{bmatrix}$	13	(d)	Parabola

Mgn/dgl/2024/+2/maths key

14	(a)	45°	14	(d)	2
15	(d)	$\frac{1}{\sqrt{5}}$	15	(c)	$\begin{bmatrix} 5 & -2 \\ 3 & -1 \end{bmatrix}$
16	(b)	$-\frac{q}{r}$	16	(a)	$x^2 + y^2$
17	(a)	0	17	(b)	y=0
18	(c)	2	18	(a)	0
19	(d)	adj (AB) = (adj A) (adj B)	19	(c)	2
20	(c)	-4	20	(d)	$\frac{1}{(x+1)^2}dx$

PART II

QUESTION NO.	CONTENT	MARK
21	$\sum_{n=1}^{12} i^n = (i^1 + i^2 + i^3 + i^4) +$ $(i^5 + i^6 + i^7 + i^8) + (i^9 + i^{10} + i^{11} + i^{12})$	1
	$= 0 + 0 + 0 = 0$	1
22	$\alpha^2 + \beta^2 = -\frac{3}{4}$ and $\alpha^2\beta^2 = \frac{169}{4}$	1

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	$x^2 + \frac{3}{4}x + \frac{169}{4} = 0\ (or)\ 4x^2 + 3x + 169 = 0$	1
23	$df = (2x + 3)dx$ $df = 0.18$	1 1
24	$y = mx$ (or) $\frac{dy}{dx} = m$ $y = \frac{dy}{dx}x$	1 1
25	MA	
26	$(x-h)^2 + (y-k)^2 = r^2$ h=-3 ; k =-4 ;r=3 $(x + 3)^2 + (y + 4)^2 = 3^2$ (or) $x^2 + y^2 + 6x + 8y + 16 = 0$	2*
27	$any\ one\ 2 \times 2\ minor \neq 0$ $\rho(A) = 2$	1 1
28	$\int_0^{\frac{\pi}{2}} sin^n x = \frac{(n-1)(n-3)(n-5)....1.}{n(n-2)(n-4).....2}\frac{\pi}{2}$ if n is even $Formula\ (or)\ \frac{9}{10} \times \frac{7}{8} \times \frac{5}{6} \times \frac{3}{4} \times \frac{1}{2} \times \frac{\pi}{2}$ $= \frac{63\pi}{512}$	1* 1

Mgn/dgl/2024/+2/maths key

29	$\lim_{x\to 1}\frac{x^2-3x+2}{x^2-4x+3}=\frac{0}{0}\ form$ $\lim_{x\to 1}\frac{2x-3}{2x-4}=\frac{1}{2}$	1 1
30	$[\vec{a},\vec{b},\vec{c}]=\begin{vmatrix}2&-1&3\\1&-1&0\\3&-1&6\end{vmatrix}=0$ *The given vectors are coplanar*	1 1

PART III

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

Question No.	Content	Marks Stages
31	$\cot^{-1}\left(\frac{1}{\sqrt{x^2-1}}\right)=\alpha$	
	$\cot\alpha=\left(\frac{1}{\sqrt{x^2-1}}\right)$	1
	$\sec\alpha=x\ \Rightarrow\alpha=\sec^{-1}x$	1
	$\cot^{-1}\left(\frac{1}{\sqrt{x^2-1}}\right)=\sec^{-1}x$	1

Mgn/dgl/2024/+2/maths key

32	*The equation of tangent* $4x + 2y + 2 = 0\ (or) 2x + y + 1 = 0$ *The equation of normal* x-2y+k=0; k=7 $x - 2y - 7 = 0$ Aliter: $xx_1+3(x+x_1)+2(y+y_1)+5=0$ $x_1= 1$; $y_1=-3$	2^* 1
33	$[\vec{a}-\vec{b}, \vec{b}-\vec{c}, \vec{c}-\vec{a}]$ $=(\vec{a}-\vec{b}).\{(\vec{b}-\vec{c})\times(\vec{c}-\vec{a})\}$ $=(\vec{a}-\vec{b}).\{\vec{b}\times\vec{c}-\vec{b}\times\vec{a}+\vec{c}\times\vec{a}\}$ $=[\vec{a}\,\vec{b}\,\vec{c}]-[\vec{a}\,\vec{b}\,\vec{c}]=0$	1 1 1
34	*u is an homogenous function of degree* $\frac{3}{2}$ $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}=\frac{3}{2}u$	1 2^*
35	*Let the two numbers be x and y* $x + y = 12$ $P(x) = x(12 - x)$ $P'(x) = 0 \Rightarrow x = 6$ $P''(x) < 0$ *at* $x = 6$ *P is maximum at* $x = 6$ $x = 6, y = 6$	1 1 1

Mgn/dgl/2024/+2/maths key

36	$I = \int_{\frac{\pi}{8}}^{\frac{3\pi}{8}} \frac{1}{1+\sqrt{\tan x}}\,dx$ **By Properties of definite integral** $I = \int_{\frac{\pi}{8}}^{\frac{3\pi}{8}} \frac{\sqrt{\tan x}}{1+\sqrt{\tan x}}\,dx$ $2I = \int_{\frac{\pi}{8}}^{\frac{3\pi}{8}} dx = \frac{\pi}{4}$ $I = \frac{\pi}{8}$	1 1 1
37	$\frac{1+i}{1-i} = i$ $\frac{1-i}{1+i} = -i$ $\left(\frac{1+i}{1-i}\right)^3 - \left(\frac{1-i}{1+i}\right)^3 = -i - i = -2i$	1 1 1
38	$\frac{dy}{1+y^2} = \frac{dx}{1+x^2}$ $\tan^{-1} y = \tan^{-1} x + c$	1 2

Mgn/dgl/2024/+2/maths key

39	The values of Random variables X are 0,1,2,3 $X = x$: 0, 1, 2, 3 $f(x)$: $\frac{1}{8}$, $\frac{3}{8}$, $\frac{3}{8}$, $\frac{1}{8}$	1 2
40	$\|A\| = -1$ $\|adj(adjA)\| = \|A\|^{(n-1)^2}$ $= (-1)^4 = 1$	1 1 1

PART IV

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

Question No.	Content	Stage Marks
41 (a)	$The\ point\ of\ intersection\ is\ \left(\frac{3}{2}, \frac{9}{4}\right)$	1
	$m_1 = 3$	1
	$m_2 = -3$	1
	$\tan\theta = \left\|\frac{m_1 - m_2}{1 + m_1 m_2}\right\| = \frac{3}{4}$	1

	$\theta = \tan^{-1}\left(\frac{3}{4}\right)$	1
41 (b)	$\tan^{-1}\left[\frac{\frac{x-1}{x-2}+\frac{x+1}{x+2}}{1-\left(\frac{x-1}{x-2}\right)\left(\frac{x+1}{x+2}\right)}\right] = \frac{\pi}{4}$	2^*
	$\frac{\frac{x-1}{x-2}+\frac{x+1}{x+2}}{1-\left(\frac{x-1}{x-2}\right)\left(\frac{x+1}{x+2}\right)} = 1$	1
	$x^2 = \frac{1}{2}$	1
	$x = \pm\frac{1}{\sqrt{2}}$	1
42 a)	**The probability mass function**	

x	2	4	6	8	10
$f(x)$	$\frac{1}{36}$	$\frac{4}{36}$	$\frac{10}{36}$	$\frac{12}{36}$	$\frac{9}{36}$

2

Cummulative distribution function

x	2	4	6	8	10
$F(x)$	$\frac{1}{36}$	$\frac{5}{36}$	$\frac{15}{36}$	$\frac{27}{36}$	1

2

$P(4 \le X < 10) = \frac{26}{36} = \frac{13}{18}$ — 1

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42 (b)	$\frac{2z+1}{iz+1} = \frac{(2x+1)+i\,2y}{(1-y)+i\,x}$	1
	If $z = \frac{a+ib}{c+id}$ **then** $\frac{ad-bc}{c^2+d^2} = 0$	1
	$= \frac{(2x+1)+i\,2y}{(1-y)+i\,x} \times \frac{(1-y)-i\,x}{(1-y)-i\,x}$	
	$Im\left(\frac{2z+1}{iz+1}\right) = 0$	2^*
	$\Rightarrow \frac{-x(2x+1)+2y(1-y)}{(1-y)^2+x^2} = 0$	1
	$2x^2 + 2y^2 + x - 2y = 0$	
43 (a)	*Diagram* $\frac{r}{5} = \frac{h}{12}$; $V = \frac{\pi}{3}\left(\frac{5h}{12}\right)^2 h$	1
	$V = \frac{25\pi}{3\times 144} h^3$	1
	$\frac{dv}{dt} = \frac{25\pi}{144} h^2 \frac{dh}{dt}$	1
	$\frac{dh}{dt} = \frac{9}{10\pi}$ m/min	2
43 (b)	*Diagram*	1
	$\vec{a} = \text{Cos}\,\alpha\vec{i} + \text{Sin}\,\alpha\vec{j}$ $\vec{b} = \text{Cos}\,\beta\vec{i} + \text{Sin}\,\beta\vec{j}$	1
	$\vec{b} \times \vec{a} = (\text{Sin}\,\alpha\,\text{Cos}\,\beta - \text{Cos}\,\alpha\,\text{Sin}\,\beta)\vec{k}$	1
	$\vec{b} \times \vec{a} = \text{Sin}\,(\alpha-\beta)\vec{k}$	1
	$\text{Sin}\,(\alpha-\beta) = \text{Sin}\,\alpha\,\text{Cos}\,\beta - \text{Cos}\,\alpha\,\text{Sin}\,\beta$	1

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44 (a)	**Diagram**	1
	$x^2 = -4ay$	1
	(3,-2.5) lies on the parabola	
	a $= \frac{9}{10}$	1
	$P(x_1, -7.5)$	1
	$x_1 = 3\sqrt{3}$ m	1
44 (b)	$P = \frac{1}{x} \quad Q = \sin x$	1
	Intergrating factor $= e^{\int p dx} = e^{\log x} = x$	1
	$xy = \int x \sin x \, dx + C$	2*
	$xy = -x \cos x + \sin x + C$	1
45(a)	$\frac{dx}{dt} = k\,x$	1
	$x = C\,e^{kt}$	1
	$t = 0 \Rightarrow C = x_0$	1
	$t = 5\,, x = 3x_0 \Rightarrow e^{5k} = 3$	1
	$t = 10\,, x = 9x_0$	1

Mgn/dgl/2024/+2/maths key

45 (b)	$\vec{a} = 2\vec{i} + 2\vec{j} + \vec{k}$ $\vec{b} = 2\vec{i} + 3\vec{j} + 3\vec{k}$ $\vec{c} = 3\vec{i} + 2\vec{j} + \vec{k}$ **Required Vector equation is** $\vec{r} = (2\vec{i} + 2\vec{j} + \vec{k}) + s(2\vec{i} + 3\vec{j} + 3\vec{k}) + t(3\vec{i} + 2\vec{j} + \vec{k})$ **Required Cartesian equation is** $3x - 7y + 5z + 3 = 0$	1 2* 2*
46 (a)	***Diagram*** $A = 4\int_0^a \frac{b}{a}\sqrt{a^2 - x^2}\,dx$ $(\int \sqrt{a^2 - x^2}\,dx = \frac{x}{2}\sqrt{a^2 - x^2} + \frac{a^2}{2}\sin^{-1}\frac{x}{a})$ $= \pi ab$	1 2* 2*
46)b)	$(y-2)^2 = 8(x-1)$ $Vertex = (1,2)$ $Focus = (3,2)$ $Equation\ of\ directrix\ is \quad x + 1 = 0$	2 1 1 1
47)a)	MA	

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47(b)	$Let\ \frac{1}{x} = a, \quad \frac{1}{y} = b, \quad \frac{1}{z} = c$	
	$\Delta = -15$	1
	$\Delta_a = -15$	1
	$\Delta_b = -5$	1
	$\Delta_c = -5$	1
	$x = 1, y = 3, z = 3$	1

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