

SHRI VIDHYABHARATHI MATRIC HR. SEC. SCHOOL



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COMMON PUBLIC EXAMINATION -MARCH -2024

XII - MATHEMATICS

TENTATIVE ANSWER KEY

PART - I

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

21.	$\sum_{n=1}^{12} i^n = 0$	2
22.	$\alpha^2 + \beta^2 = \frac{-3}{4}; \alpha^2 \beta^2 = \frac{169}{4}$ $4x^2 + 3x + 169 = 0$	1 1
23.	$df = (2x + 3)dx$ $= 0.18$	1 1
24.	$y = mx; \frac{dy}{dx} = m$ $y = x \frac{dy}{dx}$	1 1
25.	mean = $\int_1^2 2x(x-1)dx = \frac{5}{3}$	2
26.	$(x+3)^2 + (y+4)^2 = 9$ $x^2 + y^2 + 6x + 8y + 16 = 0$	1 1
27.	$\begin{vmatrix} -1 & 3 \\ 4 & -7 \end{vmatrix} = -5$ $\rho(A) = 2$	1 1
28.	$\int_0^{\frac{\pi}{2}} \sin^{10} x dx = \frac{63\pi}{512}$	2
29.	$\lim_{x \rightarrow 1} \frac{x^2 - 3x + 2}{x^2 - 4x + 3} = \lim_{x \rightarrow 1} \frac{2x - 3}{2x - 4}$ $= \frac{1}{2}$	1 1
30.	$\begin{vmatrix} 2 & -1 & 3 \\ 1 & -1 & 0 \\ 3 & -1 & 6 \end{vmatrix} = 0$ \therefore The given vectors are coplanar	1 1
PART – III		
31.	Let, $\cot \alpha = \frac{1}{\sqrt{x^2 - 1}}$ $\sec \alpha = x; \alpha = \sec^{-1} x$ $\cot^{-1} \left(\frac{1}{\sqrt{x^2 - 1}} \right) = \sec^{-1} x$	1 1 1
32.	$y = \frac{-1}{4}(x^2 + 6x + 5)$ $\frac{dy}{dx} = \frac{-1}{4}(2x + 6)$ $m = -2$ Equation of tangent: $2x + y + 1 = 0$ Equation of normal: $x - 2y - 7 = 0$	1 1 1 1

33.	$\text{LHS} = \begin{vmatrix} 1 & -1 & 0 \\ 0 & 1 & -1 \\ -1 & 0 & 1 \end{vmatrix} [\vec{a}, \vec{b}, \vec{c}] = 0$ $\therefore [\vec{a} - \vec{b}, \vec{b} - \vec{c}, \vec{c} - \vec{a}] = 0$	<p style="text-align: right;">www.Trb Tnpsc.com</p> <p style="text-align: right;">2</p> <p style="text-align: right;">1</p>										
34.	$u(\lambda x, \lambda y) = \frac{\lambda^2(x^2 + y^2)}{\sqrt{\lambda}\sqrt{x+y}} = \lambda^{\frac{3}{2}}u(x, y)$ $n = \frac{3}{2}$ <p>By Euler's theorem: $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \frac{3}{2}u$</p>	<p style="text-align: right;">1</p> <p style="text-align: right;">2</p>										
35.	$x + y = 12 \Rightarrow y = 12 - x$ $p = xy = x(12 - x)$ $p'(x) = 12 - 2x \Rightarrow p'(x) = 0$ $x = 6$ $p''(x) = -2 < 0$, p is maximum. $\therefore x = 6, y = 6$	<p style="text-align: right;">1</p> <p style="text-align: right;">1</p> <p style="text-align: right;">1</p>										
36.	$I = \int_{\frac{\pi}{8}}^{\frac{3\pi}{8}} \frac{1}{1 + \sqrt{\tan x}} dx \text{-----1}$ $I = \int_{\frac{\pi}{8}}^{\frac{3\pi}{8}} \frac{\sqrt{\tan x}}{1 + \sqrt{\tan x}} dx \text{-----2}$ <p>From 1+2</p> $I = \frac{\pi}{8}$	<p style="text-align: right;">1</p> <p style="text-align: right;">2</p>										
37.	$\left(\frac{1+i}{1-i}\right)^3 - \left(\frac{1-i}{1+i}\right)^3 = -i - i$ $= -2i$	<p style="text-align: right;">2</p> <p style="text-align: right;">1</p>										
38.	$\int \frac{dy}{1+y^2} = \int \frac{dx}{1+x^2}$ $\tan^{-1}y = \tan^{-1}x + c$	<p style="text-align: right;">1</p> <p style="text-align: right;">2</p>										
39.	<table border="1" style="margin-left: auto; margin-right: auto;"> <tbody> <tr> <td style="padding: 5px;">x</td> <td style="padding: 5px;">0</td> <td style="padding: 5px;">1</td> <td style="padding: 5px;">2</td> <td style="padding: 5px;">3</td> </tr> <tr> <td style="padding: 5px;">f(x)</td> <td style="padding: 5px;">$\frac{1}{8}$</td> <td style="padding: 5px;">$\frac{3}{8}$</td> <td style="padding: 5px;">$\frac{3}{8}$</td> <td style="padding: 5px;">$\frac{1}{8}$</td> </tr> </tbody> </table>	x	0	1	2	3	f(x)	$\frac{1}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{1}{8}$	<p style="text-align: right;">3</p>
x	0	1	2	3								
f(x)	$\frac{1}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{1}{8}$								
40.	$ A = -1$ $ \text{adj}(\text{adj}A) = A ^{(n-1)^2} = (-1)^4 = 1$ Note: Any other method	<p style="text-align: right;">1</p> <p style="text-align: right;">2</p>										
PART – IV												
41.(a)	<p>Rough Diagram</p> <p>Point of intersection = $\left(\frac{3}{2}, \frac{9}{4}\right)$</p> <p>$m_1 = 3$; $m_2 = -3$</p> <p>$\theta = \tan^{-1}\left(\frac{3}{4}\right)$</p>	<p style="text-align: right;">1</p> <p style="text-align: right;">1</p> <p style="text-align: right;">1</p> <p style="text-align: right;">2</p>										

41.(b)

$$\tan^{-1}\left(\frac{\frac{x-1}{x-2} \cdot \frac{x+1}{x+2}}{1 - \left(\frac{x-1}{x-2}\right)\left(\frac{x+1}{x+2}\right)}\right) = \frac{\pi}{4}$$

$$\frac{(x-1)(x+2) + (x+1)(x-2)}{(x-2)(x+2) + (x+1)(x-1)} = 1$$

$$2x^2 - 4 = -3 \Rightarrow x = \pm \frac{1}{\sqrt{2}}$$

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1
2
2

42.(a)

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

$$F(x) = \begin{cases} 0, & \text{if } -\infty < x < 2 \\ \frac{1}{36} & \text{if } 2 \leq x < 4 \\ \frac{5}{36} & \text{if } 4 \leq x < 6 \\ \frac{15}{36} & \text{if } 6 \leq x < 8 \\ \frac{27}{36} & \text{if } 8 \leq x < 10 \\ 1 & \text{if } 10 \leq x < \infty \end{cases}$$

$$P(4 \leq x < 10) = \frac{13}{18}$$

2
2

42.(b)

$$\left(\frac{2z+1}{iz+1}\right) = \frac{2(x+iy)+1}{i(x+iy)+1}$$

$$\text{Im}\left(\frac{(2x+1)+i2y}{(1-y)+ix}\right) = 0$$

$$\Rightarrow \frac{2y(1-y) - x(2x+1)}{(1-y)^2 + x^2} = 0$$

$$2x^2 + 2y^2 + x - 2y = 0.$$

1
2
1
1

43.(a)

Rough Diagram

$$r = \frac{5}{12}h$$

$$V = \frac{1}{3}\pi\left(\frac{5}{12}h\right)\left(\frac{5}{12}h\right)h$$

$$\frac{dV}{dt} = \frac{25}{144}\pi \times h^2 \times \frac{dh}{dt}$$

$$\frac{dh}{dt} = \frac{9}{10\pi} \text{ m/min}$$

1
1
1
1
1

43.(b)

Diagram

$$\vec{OP} = \cos \alpha \vec{i} + \sin \alpha \vec{j}$$

$$\vec{OQ} = \cos \beta \vec{j} + \sin \beta \vec{k}$$

$$\vec{OQ} \times \vec{OP} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ \cos \beta & \sin \beta & 0 \\ \cos \alpha & \sin \alpha & 0 \end{vmatrix}$$

$$= \hat{k}(\sin \alpha \cos \beta - \cos \alpha \sin \beta) \dots (1)$$

By definition

$$\vec{OQ} \times \vec{OP} = |\vec{OQ}||\vec{OP}|\sin(\alpha - \beta)\hat{k} = \sin(\alpha - \beta)\hat{k} \dots (2)$$

From (1) and (2)

$$\sin(\alpha - \beta) = \sin \alpha \cos \beta - \cos \alpha \sin \beta$$

1
1
1
1
1

44.(a)	Rough Diagram $x^2 = -4ay$ $a = \frac{9}{10}$ It's passes through, $(x_1, -7.5)$ $x^2 = -4\left(\frac{9}{10}\right)y$ $x_1 = 3\sqrt{3}mt.$	1 1 1 1 1
44.(b)	$P = \frac{1}{x}, Q = \sin x$ $I.F = e^{\int p dx} = x$ $xy = \int x \sin x dx + c$ $xy = \sin x - x \cos x + c$	1 1 2 1
45.(a)	$\frac{dx}{dt} \propto x \Rightarrow \frac{dx}{dt} = kx \Rightarrow x = ce^{kt}$ $t=0; X=X_0 \Rightarrow C=X_0$ $X=X_0 e^{kt}$ $t=5; X=3X_0 \Rightarrow e^{5k}=3$ $t=10; X=9X_0$	1 1 1 1 1
45.(b)	$\vec{a} = 2\hat{i} + 2\hat{j} + \hat{k}; \vec{b} = 2\hat{i} + 3\hat{j} + 3\hat{k}; \vec{c} = 3\hat{i} + 2\hat{j} + \hat{k}$ Parametric form $\vec{r} = (2\hat{i} + 2\hat{j} + \hat{k}) + s(2\hat{i} + 3\hat{j} + 3\hat{k}) + t(3\hat{i} + 2\hat{j} + \hat{k})$ (or) non Parametric form $\vec{r} \cdot (3\hat{i} - 7\hat{j} + 5\hat{k}) = -3$ Cartesian form $\begin{vmatrix} x-2 & y-2 & z-1 \\ 2 & 3 & 3 \\ 3 & 2 & 1 \end{vmatrix} = 0$ $3x - 7y + 5z + 3 = 0$	1 1 2 1
46.(a)	Diagram The required Area $= 4 \int_0^a y dx = 4 \int_0^a \frac{b}{a} \sqrt{a^2 - x^2} dx$ $= \frac{4b}{a} \left[\frac{x}{2} \sqrt{a^2 - x^2} + \frac{a^2}{2} \sin^{-1} \left(\frac{x}{a} \right) \right]_0^a$ $= \pi ab$ sq. units	1 1 2 1
46.(b)	Equation of parabola: $(y - 2)^2 = 8(x - 1)$ Vertex: (1,2) Focus: (3,2) Equation of directrix: $x + 1 = 0$	2 1 1 1

47.(a)	p	q	$p \leftrightarrow q$	$\sim p$	$\sim q$	$(\sim p) \vee q$	$(\sim q) \vee p$	$((\sim p) \vee q) \wedge ((\sim q) \vee p)$	4
	T	T	T	F	F	T	T	T	
	T	F	F	F	T	F	T	F	
	F	T	F	T	F	T	F	F	
	F	F	T	T	T	T	T	T	
From column (3),(8) $p \leftrightarrow q \equiv ((\sim)p \vee q) \wedge ((\sim)q \vee p)$									1
47.(b)	$\Delta = -15$ $\Delta X = -15$ $\Delta Y = -5$ $\Delta Z = -5$ $(X, Y, Z) = (1, 3, 3)$								1 1 1 1 1

MARK ANALYSIS

(WITHOUT CHOICE)

PART	Questions	Total Questions	Book Back Questions	Interior/Creative Questions	Total Marks
I	1 Mark	20	16	4	20
II	2 Marks	10	9	1	20
III	3 Marks	10	9	1	30
IV	5 Marks	14	12	2	70
Total Marks			121	19	140
Percentage			86%	14%	100%

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