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) adj(AB)=(adjA) (adjB)	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) adj(AB)=(adjA) (adjB)	(c) 2	1
20.	(c) -4	(d) $\frac{1}{(x+1)^2}$ dx	1

PART – II

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 ρ(A)=2	1 1
28.	$\int_0^{\frac{\pi}{2}} \sin^{10}x dx = \frac{63\pi}{512}$	2
29.	$\lim_{x\to1}\frac{x^2-3x+2}{x^2-4x+3} = \lim_{x\to1}\frac{2x-3}{2x-4}$ $=\frac{1}{2}$	1 1
30.	$\begin{vmatrix} 2 & -1 & 3 \\ 1 & -1 & 0 \\ 3 & -1 & 6 \end{vmatrix} = 0$ ∴The given vectors are coplanar	1 1

PART – III

31.	Let, cot**α** $= \frac{1}{\sqrt{x^2-1}}$ sec**α**=x ; **α**=$\sec^{-1}x$ $\cot^{-1}\left(\frac{1}{\sqrt{x^2-1}}\right) = \sec^{-1}x$	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

33.	LHS= $\begin{vmatrix} 1 & -1 & 0 \\ 0 & 1 & -1 \\ -1 & 0 & 1 \end{vmatrix}$ $[\vec{a},\vec{b},\vec{c}]$=0 $\therefore[\vec{a}-\vec{b},\vec{b}-\vec{c},\vec{c}-\vec{a},]=0$	2 1
34.	u(λx,λy) = $\frac{\lambda^{2}(x^2+y^2)}{\sqrt{\lambda}\sqrt{x+y}} = \lambda^{\frac{3}{2}}u(x,y)$ $n=\frac{3}{2}$ By euler's theorem: $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}=\frac{3}{2}u$	1 2
35.	x+y=12⟹y=12-x p=xy =x(12-x) p'(x)=12-2x⟹$p'(x) = 0$ x=6 p''(x) = -2<0, p is maximum. ∴x=6,y=6	1 1 1
36.	$I=\int_{\frac{\pi}{8}}^{\frac{3\pi}{8}} \frac{1}{1+\sqrt{\tan x}}dx$--------1 $I=\int_{\frac{\pi}{8}}^{\frac{3\pi}{8}} \frac{\sqrt{\tan x}}{1+\sqrt{\tan x}}dx$--------2 From 1+2 $I=\frac{\pi}{8}$	1 2
37.	$\left(\frac{1+i}{1-i}\right)^3-\left(\frac{1-i}{1+i}\right)^3$ = -i-i = -2i	2 1
38.	$\int\frac{dy}{1+y^2}=\int\frac{dx}{1+x^2}$ $\tan^{-1}y = \tan^{-1}x+c$	1 2
39.	x: 0, 1, 2, 3 f(x): $\frac{1}{8}$, $\frac{3}{8}$, $\frac{3}{8}$, $\frac{1}{8}$	3
40.	$\|A\| = -1$ $\|adj(adjA)\|=\|A\|^{(n-1)^2}=(-1)^4=1$ **Note: Any other method**	1 2
	PART – IV	
41.(a)	Rough Diagram Point of intersection=$\left(\frac{3}{2},\frac{9}{4}\right)$ $m_1=3$; $m_2=-3$ $\theta=\tan^{-1}\left(\frac{3}{4}\right)$	1 1 1 2

41.(b)	$\tan^{-1}\left(\dfrac{\frac{x-1}{x-2}+\frac{x+1}{x+2}}{1-\left(\frac{x-1}{x-2}\right)\left(\frac{x+1}{x+2}\right)}\right)=\dfrac{\pi}{4}$ $\dfrac{(x-1)(x+2)+(x+1)(x-2)}{(x-2)(x+2)+(x+1)(x-1}=1$ $2x^2-4=-3 \Rightarrow x=\pm\frac{1}{\sqrt{2}}$	1 2 2
42.(a)	x: 2, 4, 6, 8, 10; f(x): $\frac{1}{36}$, $\frac{4}{36}$, $\frac{10}{36}$, $\frac{12}{36}$, $\frac{9}{36}$ $F(x)=\begin{cases}0 & ,\text{if} -\infty < x < 2\\ \frac{1}{36} & \text{if } 2 \le x < 4\\ \frac{5}{36} & \text{if } 4 \le x < 6\\ \frac{15}{36} & \text{if } 6 \le x < 8\\ \frac{27}{36} & \text{if } 8 \le x < 10\\ 1 & \text{if } 10 \le x < \infty\end{cases}$ $P(4 \le x < 10)=\frac{13}{18}$	2 2 1
42.(b)	$\left(\dfrac{2z+1}{iz+1}\right)=\dfrac{2(x+iy)+1}{i(x+iy)+1}$ $\text{Im}\left(\dfrac{(2x+1)+i2y}{(1-y)+ix}\right)=0$ $\Rightarrow\dfrac{2y(1-y)-x(2x+1)}{(1-y)^2+x^2}=0$ $2x^2+2y^2+x-2y=0.$	1 2 1 1
43.(a)	Rough Diagram $r=\frac{5}{12}h$ $V=\frac{1}{3}\pi\left(\frac{5}{12}h\right)\left(\frac{5}{12}h\right)h$ $\frac{dV}{dt}=\frac{25}{144}\pi\times h^2\times\frac{dh}{dt}$ $\frac{dh}{dt}=\frac{9}{10\pi}$ m/min	1 1 1 1 1
43.(b)	Diagram $\overrightarrow{OP}=\cos\alpha\vec{i}+\sin\alpha\vec{j}$ $\overrightarrow{OQ}=\cos\beta\vec{j}+\sin\beta\vec{j}$ $\overrightarrow{OQ}\times\overrightarrow{OP}=\begin{vmatrix}\hat{i} & \hat{j} & \hat{k}\\ \cos\beta & \sin\beta & 0\\ \cos\alpha & \sin\alpha & 0\end{vmatrix}$ $=\hat{k}(\sin\alpha\cos\beta-\cos\alpha\sin\beta)\ .....(1)$ By definition $\overrightarrow{OQ}\times\overrightarrow{OP}=\lvert\overrightarrow{OQ}\rvert\lvert\overrightarrow{OP}\rvert\sin(\alpha-\beta)\hat{k}=\sin(\alpha-\beta)\hat{k}.....(2)$ 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)	$P = \frac{1}{x}$, $Q = sinx$ I.F= $e^{\int pdx} = x$ $xy = \int xsinx\, dx + c$ xy=sinx-xcosx+c	1 1 2 1
45.(a)	$\frac{dx}{dt} \propto x \Rightarrow \frac{dx}{dt} = kx \Rightarrow x = ce^{kt}$ t=0 ; $X=x_0 \Rightarrow C=X_0$ $X=X_0e^{kt}$ t=5 ; $X=3x_0 \Rightarrow e^{5K}=3$ t=10 ; $X=9x_0$	1 1 1 1 1
45.(b)	$\vec{a}=2\hat{\imath}+2\hat{\jmath}+\hat{k}$; $\vec{b}=2\hat{\imath}+3\hat{\jmath}+3\hat{k}$; $\vec{c}=3\hat{\imath}+2\hat{\jmath}+\hat{k}$ **Parametric form** $\vec{r}=(2\hat{\imath}+2\hat{\jmath}+\hat{k})+s(2\hat{\imath}+3\hat{\jmath}+3\hat{k})+t(3\hat{\imath}+2\hat{\jmath}+\hat{k})$ **(or) non Parametric form** $\vec{r}.(3\hat{\imath}-7\hat{\jmath}+5\hat{k})=-3$ **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 = $4\int_0^a ydx = 4\int_0^a \frac{b}{a}\sqrt{a^2-x^2}\,dx$ $= \frac{4b}{a}\left[\frac{x}{2}\sqrt{a^2-x^2}+\frac{a^2}{2}\sin^{-1}\left(\frac{x}{a}\right)\right]_0^a$ =πab 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↔q	∽p	∽q	(∽p)∨q	(∽q)∨p	((∽p)∨q)∧((∽q)∨p)
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

4

From column (3),(8)

p↔q≡((∽)p∨q)∧((∽)q∨p) 1

47.(b)

Δ= -15 1

ΔX =-15 1

ΔY = -5 1

ΔZ = -5 1

(X,Y,Z)=(1,3,3) 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%

DEPARTMENT OF MATHEMATICS