

**SHRI VIDHYABHARATHI MATRIC
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MARCH – 2025

XII - MATHEMATICS

TENTATIVE ANSWER KEY

MARK ANALYSIS

(WITHOUT CHOICE)

PART	Questions	Total Questions	Book Back Questions	Interior/Creative Questions	Total Marks
I	1 Mark	20	17	3	20
II	2 Marks	10	8	2	20
III	3 Marks	10	8	2	30
IV	5 Marks	14	11	3	70
Total Marks			112	28	140
Percentage			80%	20%	100%

(A) Type

(B) Type

1. (a) N
2. (d) 2
3. (d) $\frac{1}{5}$
4. (d) 2.5
5. (a) 1, 2
6. (a) 19
7. (b) $y = x^3 + 2$
8. (b) $[1, 2]$
9. (d) $2xu$
10. (b) 2
11. (b) $\pm \frac{1}{\sqrt{2}}(1+i)$
12. (b) $1+i$
13. (d) 0.25
14. (c) $\pi/2$
15. (a) (1, 0)
16. (b) $\pi/6$
17. (c) $\frac{\pi a^3}{b}$
18. (b) $\frac{1}{\sqrt{2}}$
19. (a) π
20. (b) $\frac{1}{f(x)} f'(x) dx$

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2. (a) π
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15. (b) $1+i$
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17. (b) $\pm \frac{1}{\sqrt{2}}(1+i)$
18. (b) $y = x^3 + 2$
19. (d) 0.25
20. (b) 2

$$(27) \text{adj } A = \begin{bmatrix} -1 & 2 & 2 \\ 1 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$$

$$|\text{adj } A| = 9$$

$$A^{-1} = \frac{1}{|\text{adj } A|} \text{adj } A.$$

$$A^{-1} = \frac{1}{9} \begin{bmatrix} -1 & 2 & 2 \\ 1 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$$

$$(27) \frac{dy}{dx} = \frac{\sqrt{1-y^2}}{\sqrt{1-x^2}}$$

$$\int \frac{dy}{\sqrt{1-y^2}} = \int \frac{dx}{\sqrt{1-x^2}}$$

$$\sin^{-1} y = \sin^{-1} x + C.$$

$$(28) \int_{-\infty}^{\infty} f(x) dx = 1$$

$$c \int_1^4 x^2 dx = 1 \quad \boxed{c = \frac{1}{21}}$$

$$(22) \text{Re} \left(\frac{1}{z} \right) = \text{Re} \left[\frac{1}{x+iy} \times \frac{x-iy}{x-iy} \right]$$

$$\text{Re} \left(\frac{1}{z} \right) = \frac{x}{x^2+y^2}$$

$$(23) \tan^{-1}(-\sqrt{3}) = -\tan^{-1}(\sqrt{3}) \\ = -\pi/3 \in \left(-\frac{\pi}{2}, \frac{\pi}{2} \right)$$

$$(29) \text{The roots are } -2+i, -2-i$$

$$x^2 - s_1 x + s_2 = 0$$

$$s_1 = -4, \quad s_2 = 5$$

$$x^2 + 4x + 5 = 0$$

$$(24) y = 4x + c \Rightarrow m = 4$$

$$x^2 + y^2 = 9 \Rightarrow a^2 = 9$$

$$c = a^2(1+m^2) \Rightarrow \boxed{c = \pm 3\sqrt{17}}$$

$$(25) x+5=0, \quad x=-5$$

$$\lim_{x \rightarrow 5^+} f(x) = \lim_{x \rightarrow 5} \frac{x^2 - 6x + 7}{x+5} = +\infty$$

vertical asy at $x = -5$

slant asy at $y = x - 1$.

$$(26) F(x, y) = \frac{t^2(x^2 + 5x - 10y^2)}{t(3x + 7y)}$$

$$F(x, y) = t^1 f(x, y)$$

F is homogeneous function of degree 1.

$$(30) f(x) = \sin x \\ \int_0^\pi f(x) dx = \int_0^\pi \sin x dx$$

$$f(2\pi - x) = \sin(\pi - x) = \sin x = f(x)$$

$$\therefore \int_0^\pi f(x) dx = 2 \int_0^{\frac{\pi}{2}} \sin x dx \\ = 2 \int_0^{\frac{\pi}{2}} f(x) dx.$$

31. $X = A^{-1} B$
 $|A| = -1$ $\text{adj } A = \begin{bmatrix} 2 & -5 \\ -1 & 2 \end{bmatrix}$
 $A^{-1} = \begin{bmatrix} -2 & 5 \\ 1 & -2 \end{bmatrix}$ $x = -11,$
 $y = 4.$

32. $z_1 = z,$ $z_2 = 6 + 8i$
 $|z - 10| \leq |z + 6 + 8i| \leq 2 + 10$
 $8 \leq |z + 6 + 8i| \leq 12$ H.P.

33. The Roots are $7, -1, \frac{1}{7}$

34. LHS = $\tan^{-1} \frac{2}{11} + \tan^{-1} \frac{7}{24}$
 $= \tan^{-1} \left[\frac{\frac{2}{11} + \frac{7}{24}}{1 - \frac{2}{11} \cdot \frac{7}{24}} \right]$
 $= \tan^{-1} \left[\frac{125}{250} \right] = \tan^{-1} \left(\frac{1}{2} \right)$
 $= \text{RHS.}$

35.
$$= \begin{vmatrix} 1 & 0 & 1 \\ 1 & 1 & 0 \\ 1 & 1 & 1 \end{vmatrix} \begin{bmatrix} \vec{a} & \vec{b} & \vec{c} \end{bmatrix}$$

 $= 1 \begin{bmatrix} \vec{a} & \vec{b} & \vec{c} \end{bmatrix}$
 $= \begin{bmatrix} \vec{a} & \vec{b} & \vec{c} \end{bmatrix} = \text{RHS}$

36. $\frac{dy}{dt} = \frac{\partial y}{\partial x} \cdot \frac{dx}{dt} + \frac{\partial y}{\partial y} \cdot \frac{dy}{dt}$
 $\frac{\partial y}{\partial x} = 2xy + 3y^4$ $\frac{dx}{dt} = e^t$
 $\frac{\partial y}{\partial y} = x^2 + 3x(4y^3)$ $\frac{dy}{dt} = \cos t$
 $\frac{dy}{dt} = e^t \left[2e^t \sin t + 3\sin^4 t + e^t \cos t + 12\sin^3 t \cos t \right]$

37. $I = \int_0^{\frac{\pi}{2}} \frac{dx}{1 + 5 \cos^2 x}$
 $t = \tan x, dt = \sec^2 x dx$
 $= \int_0^{\frac{\pi}{2}} \frac{\sec^2 x dx}{6 + \tan^2 x}$
 $= \int_0^{\infty} \frac{dt}{(\sqrt{6})^2 + t^2} = \frac{\pi}{2\sqrt{6}}$

38. $E(x) = -0.50$

winning amount = -0.50 paise

39. $f(x) = x^3 + 2x + 1$ $f(2) = 13$
 $f'(x) = 3x^2 + 2$ $f'(2) = 14$
 $f''(x) = 6x$ $f''(2) = 12$
 $f'''(x) = 6$ $f'''(2) = 6$
 $f^{IV}(x) = 0$ $f^{IV}(2) = 0$
 $= 13 + \frac{(x-2)(14)}{1!} + \frac{(x-2)^2(12)}{2!} + \frac{(x-2)^3(6)}{3!} + 0 + 0$
 $= 13 + 14(x-2) + 6(x-2)^2 + (x-2)^3$

40. $\left(\frac{3}{2}\right) * m = \frac{87}{10}$

$\frac{3}{2} + m - \frac{3}{2}(m) + 17 = \frac{87}{10}$

$\frac{17}{2} - \frac{m}{2} = \frac{87}{10}$

$m = -2/5.$

Part - IV

41) (a) $\Delta = 6$.

$\Delta_1 = 12, \Delta_2 = -6, \Delta_3 = 24$

$\Rightarrow x_1 = 2, x_2 = -1, x_3 = 4$

(b) $m = \frac{dy}{dx} = \frac{-2\cos t}{7\sin t}$

Eqn of tangent $\Rightarrow y - 2\sin t = \frac{-2\cos t}{7\sin t}(x - 7\cos t)$

$\Rightarrow 2x\cos t + 7y\sin t = 14$

Eqn of normal

$7x\sin t - 2y\cos t = 45\sin t\cos t$

42) (a) $(z-1)^3 + 8 = 0$

$(z-1)^3 = (-1)^{1/3}(2)$

$= 2(-1, -\omega, -\omega^2)$

$z - 1 = -2, -2\omega, -2\omega^2$

$z = -1, 1-2\omega, 1-2\omega^2$

(b) $y^2 = x$

$y = x - 2$

$\Rightarrow$ POI $(4, 2)$ & $(1, -1)$

$A = \int_{-1}^2 (y + 2 - y^2) dy$

$= 9/2 = 4.5 \text{ units}$

43) (a) Given eqn is reciprocal equation. Therefore 3 also root
By synthetic division $3, 1/3$ are roots

$\Rightarrow x = -2, -1/2$

 $\therefore$ The roots are $3, 1/3, -2, -1/2$

43) (b) $\frac{dy}{dx} = \frac{-x^2 + 2y^2}{2xy}$

$y = vx \Rightarrow v + x \frac{dv}{dx} = \frac{-1 + 3v^2}{2v}$

$\int \frac{2v}{v^2 - 1} dv = \int \frac{dx}{x}$

$y^2 - x^2 = cx^3$

44) (a)

$x^2 = -4ay$

At $(15, -10)$

$a = 45/8$

$x^2 = -\frac{45}{2}y$

At $(6, -y) \Rightarrow y = 1.6$

 $\therefore$ The required height = $10 - 1.6$

(b)

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

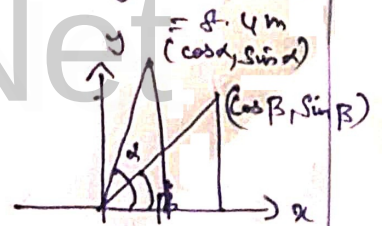
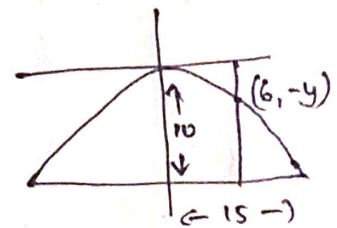
$\vec{b} = \cos \beta \hat{i} + \sin \beta \hat{j}$

$\vec{a} \cdot \vec{b} = \cos \alpha \cos \beta + \sin \alpha \sin \beta \rightarrow (1)$

Also $\vec{a} \cdot \vec{b} = \cos(\alpha - \beta) \rightarrow (2)$

$(1) = (2) \Rightarrow \cos(\alpha + \beta) =$

$\cos \alpha \cos \beta + \sin \alpha \sin \beta$



46) (a) $(x_1, y_1, z_1) = (0, 1, -5)$

$(l_1, m_1, n_1) = (2, 3, 6)$

$(l_2, m_2, n_2) = (1, 1, -1)$

$V \cdot N \cdot P \Rightarrow \vec{r} \cdot (-9\hat{i} + 8\hat{j} - \hat{k}) = 13$

$C \cdot E \Rightarrow 9x - 8y + z = -13$

$$46) (b) \frac{dA}{dt} \propto A \Rightarrow \frac{dA}{dt} = KA$$

$$A = Ce^{kt}$$

$$t=0, A=A_0 \Rightarrow A = A_0 e^{kt}$$

$$t=50, A=2A_0 \Rightarrow K = \frac{\log 2}{50}$$

$$A=3A_0, t=?$$

$$t = 50 \frac{\log 3}{\log 2} \text{ years.}$$

47) (a)

$$h = \frac{b}{a}(a-r)$$

$$V = \pi r^2 h$$

$$V = \frac{\pi b}{a}(ar^2 - r^3)$$

$$V' = \frac{\pi b}{a}(2ar - 3r^2)$$

$$V'' = \frac{\pi b}{a}(2a - 6r)$$

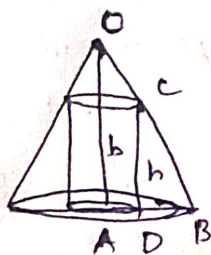
$$V' = 0 \Rightarrow r = \frac{2a}{3}$$

$$V''\left(\frac{2a}{3}\right) < 0 \Rightarrow V \text{ attaining maximum.}$$

$$V = \frac{\pi b}{a} \left(a \left(\frac{4a^2}{9} \right) - \frac{8a^3}{27} \right)$$

$$V = \frac{4}{9} \left(\frac{1}{3} \pi a^2 b \right)$$

$$V = \frac{4}{9} (\text{Vol of cone})$$



47) (b)

$P \wedge (q \vee r)$	$(P \wedge q) \vee (P \wedge r)$
T	T
T	T
T	T
F	F
F	F
F	F
F	F
F	F

T

T

T

F

F

F

F

F

T

T

T

F

F

F

F

F

①

②

① = ②

$$\therefore P \wedge (q \vee r) \equiv (P \wedge q) \vee (P \wedge r)$$

A5) (a) $P = \frac{8}{9}, q = \frac{1}{9}, n = 6$

(i) $P(x=3) = {}^6C_3 \left(\frac{8}{9}\right)^3 \left(\frac{1}{9}\right)^3$

(ii) $n=4, P = \frac{1}{9}, q = \frac{8}{9}$

$$P(x=0) = {}^4C_0 \left(\frac{1}{9}\right)^0 \left(\frac{8}{9}\right)^4$$

(b) $F_1(2,1), F_2(-2,1)$

$$C(0,1)$$

$$c^2 = 4, \frac{2b^2}{a} = 6$$

$$\Rightarrow b^2 = a^2 - c^2$$

$$\Rightarrow a^2 - 3a - 4 = 0 \Rightarrow a = 4, -1$$

$$a^2 = 16, b^2 = 12$$

$$\frac{x^2}{16} + \frac{(y-1)^2}{12} = 1$$



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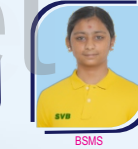
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