

Sethu Bhaskara MHSS.
Quarterly Exams '18

12 STD MATHEMATICS

SECTION - I

1. d) k^{n-1} (adj)l
2. b) 2
3. a) $\Delta \neq 0$
4. b) $-\sqrt{3}$
5. d) $\cos^{-1}(-34/63)$
6. b) $x + 9y + 11z = 0$
7. d) $\pm \frac{1}{3} (2\vec{i} - \vec{j} + 2\vec{k})$
8. b) $\cos \theta - i \sin \theta$
9. c) $2 + i$
10. a) $2\pi/n$
11. d) $x = -17/4$
12. a) $(0, \pm 3)$
13. b) corresponding direction
14. c) $2\pi/3$
15. a) $-\cot \theta$
16. b) 0
17. c) not in the indeterminate form as $x \rightarrow 0$
18. b) $k = -a/2$
19. a) $x \leq 1$
20. b) 4.021

SECTION - II

- 21) $\Delta = 0; \Delta x \neq 0$ — (1)
Inconsistent, No solution — (1)

$$22) (AB)^T = \begin{pmatrix} -2 & 4 & 5 \\ -6 & 12 & 15 \\ 12 & -24 & -30 \end{pmatrix} \text{--- (1)}$$

$$B^T A^T = \begin{pmatrix} -2 & 4 & 5 \\ -6 & 12 & 15 \\ 12 & -24 & -30 \end{pmatrix} \text{--- (1)}$$

$$23) \vec{r} \times \vec{F} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ 2 & 3 & 1 \\ 4 & 2 & 1 \end{vmatrix} \text{--- (1)}$$

$$= \vec{i} + 2\vec{j} - 8\vec{k} \text{--- (1)}$$

$$24) \theta = \sin^{-1} \left(\frac{|\vec{b} \cdot \vec{n}|}{|\vec{b}| \cdot |\vec{n}|} \right) \text{--- (1)}$$

$$= \sin^{-1} \left(\frac{3}{\sqrt{964}} \right) \text{--- (1)}$$

$$25) \frac{1}{1+2\omega} + \frac{1}{2+\omega} - \frac{1}{1+\omega}$$

$$= \frac{3(1+\omega)}{3\omega} + \left(\frac{+\omega^3}{\omega^2} \right) \text{--- (1)}$$

$$= 0 \text{--- (1)}$$

$$26) \frac{e^{i60} \times e^{-i90}}{e^{-i240} \times e^{i80}} = e^{i130} \text{--- (1)}$$

$$= \cos 130 + i \sin 130 \text{--- (1)}$$

$$27) ae = 3, a = 5 \text{--- (1)}$$

$$\frac{x^2}{25} + \frac{y^2}{16} = 1 \text{--- (1)}$$

28) $f(x)$ is not diff on $(0, 2)$ — (1)
Rolle's theorem does not hold — (1)

29) Let $f(x) = \cos x - \sin x = 0$ — (1)

$f(\pi/4) = \sqrt{2}$ is max
at $x = \pi/4$ — (1)

30) $dy = \frac{-dx}{2\sqrt{1-x}}$ — (1)

$= -0.01$ — (1)

SECTION - III

31) Ad of $A = \begin{pmatrix} -3 & 6 & 6 \\ -6 & 3 & -6 \\ -6 & -6 & 3 \end{pmatrix}$ — (1)

$3A^T = \begin{pmatrix} -3 & 6 & 6 \\ -6 & 3 & -6 \\ -6 & -6 & 3 \end{pmatrix}$ — (2)

32) $A = \begin{pmatrix} 4 & 2 & 1 & 3 \\ 6 & 3 & 4 & 7 \\ 2 & 1 & 0 & 1 \end{pmatrix}$

$\sim \begin{pmatrix} 1 & 2 & 4 & 3 \\ 4 & 3 & 6 & 1 \\ 0 & 1 & 2 & 1 \end{pmatrix}$ — (1)

$\sim \begin{pmatrix} 1 & 2 & 4 & 3 \\ 0 & 1 & 2 & 1 \\ 0 & 0 & 0 & 0 \end{pmatrix}$ — (1)

$\Rightarrow \rho(A) = 2$ — (1)

33) Diagram — (1)

$\frac{1}{2} |\vec{a} \times \vec{b}| = \frac{1}{2} |\vec{b} \times \vec{c}| = \frac{1}{2} |\vec{c} \times \vec{a}|$ — (1)

$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$ — (1)

34. $(\vec{x} - \vec{a}) \cdot (\vec{x} - \vec{b}) = 35$
(Any method)

35. $3 \pm i$ is a root
 $3 - i$ is also root, $x^2 - 6x + 10$
one factor $x^2 - 2x + 2$ — (1)
Roots $3 \pm i, 1 \pm i$ — (1)

36. $\frac{y^2}{1/4} - \frac{x^2}{25/4} = 1$ — (1)

$e = \frac{b}{a}$ — (1)

Vertices: $(0, \pm \frac{5}{2})$
Foci: $(0, \pm 3)$ — (1)

37. $\tan \theta = \left| \frac{2\sqrt{b^2 - ab}}{a+b} \right|$ — (1)

$\theta = \tan^{-1}(7)$ — (2)

38. $m_1 = e^x$ — (1)

$m_2 = -e^{-x}$ — (1)

$m_1 \times m_2 = -1$ — (1)

39.

$\frac{dw}{dt} = \frac{\partial w}{\partial x} \cdot \frac{\partial x}{\partial t} + \frac{\partial w}{\partial y} \cdot \frac{\partial y}{\partial t} + \frac{\partial w}{\partial z} \cdot \frac{\partial z}{\partial t}$ — (1)

$= y(-\sin t) + x \cos t + 1$ — (1)

$= 2 \cos^2 t$ — (1)

40.

$\frac{\partial u}{\partial x} = \frac{\sec^2 x}{\tan x + \tan y + \tan z}$ — (1)

$$\sin 2x \frac{\partial u}{\partial x} = \frac{2 \tan x}{\tan x + \tan y + \tan z} \quad \text{--- (1)}$$

$$\Rightarrow \sum \sin 2x \frac{\partial u}{\partial x} = 2 \quad \text{--- (1)}$$

SECTION - IV

$$41) a) \left. \begin{aligned} a+2b-c &= 1 \\ 2a+4b+c &= 5 \\ 3a-2b-2c &= 0 \end{aligned} \right\} \quad \text{--- (1)}$$

$$\left. \begin{aligned} \Delta &= 24 \\ \Delta a &= 24 \\ \Delta b &= 12 \\ \Delta c &= 24 \end{aligned} \right\} \quad \text{--- (3)}$$

$$\Rightarrow (x, y, z) = (1, 2, 1) \quad \text{--- (1)}$$

$$b) \quad z = x + iy \quad \text{--- (1)}$$

$$\arg \left(\frac{z-2}{z-6i} \right) = \pi/2 \quad \text{--- (1)}$$

$$\frac{xy - (x-2)(y-2)}{(x-2)x + y(y-6)} = \frac{1}{0} \quad \text{--- (2)}$$

$$x^2 + y^2 - 2x - 6y = 0 \quad \text{--- (1)}$$

42) a)

$$\vec{a} \times \vec{b} = \vec{i} + \vec{j} - 2\vec{k} \quad \text{--- (1)}$$

$$\vec{c} \times \vec{d} = \vec{i} - 3\vec{j} + \vec{k} \quad \text{--- (1)}$$

$$\begin{aligned} (\vec{a} \times \vec{b}) \times (\vec{c} \times \vec{d}) \\ = -5\vec{i} - 3\vec{j} - 4\vec{k} \quad \text{--- (1)} \end{aligned}$$

$$\begin{aligned} [\vec{a} \times \vec{b} \cdot \vec{c}] \vec{d} - [\vec{a} \cdot \vec{b} \times \vec{c}] \vec{d} \\ = 1(\vec{c}) - (-2)\vec{d} \quad \text{--- (1)} \end{aligned}$$

$$= -5\vec{i} - 3\vec{j} - 4\vec{k} \quad \text{--- (1)}$$

b)

$$\frac{1}{2} - i\frac{\sqrt{3}}{2} = \cos(-\pi/3) + i \sin(-\pi/3) \quad \text{--- (1)}$$

$$\left(\frac{1}{2} - i\frac{\sqrt{3}}{2} \right)^{3/4} = \cos\left(\frac{2k-1}{4}\right) + i \sin\left(\frac{2k-1}{4}\right) \quad \text{--- (1)}$$

$$k = 0, 1, 2, 3$$

$$\text{--- (2)}$$

$$\text{Values } \cos(\pi/4), \cos(3\pi/4)$$

$$\cos(5\pi/4), \cos(7\pi/4) \quad \text{--- (1)}$$

$$\text{Product} = 1 \quad \text{--- (1)}$$

43) a) roots $1 \pm i$

$$\alpha = 1+i; \beta = 1-i \quad \text{--- (1)}$$

$$\frac{(y+\alpha)^n - (y+\beta)^n}{\alpha - \beta}$$

$$= \frac{(\cot \theta - 1 + 1+i)^n - (\cot \theta - 1 + 1-i)^n}{1+i - 1-i} \quad \text{--- (1)}$$

$$= \frac{\cos n\theta + i \sin n\theta - \cos n\theta + i \sin n\theta}{2i \sin \theta} \quad \text{--- (2)}$$

$$= \frac{\sin n\theta}{\sin \theta} \quad \text{--- (1)}$$

$$b) (x-3)^2 = 12(y+1) \quad \text{--- (1)}$$

$$X = x-3; Y = y+1; a=3$$

Axis	$X=0$	$x-3=0$
Vertex	$(0,0)$	$(3,-1)$
Focus	$(0,3)$	$(3,2)$
Dx	$Y=-3$	$y+4=0$
LR	$Y=3$	$y-2=0$
Lengths	12	12 --- (3)

Diagram --- (1)

44) a) Diagram — ①
 Vector form — ②
 Cartesian form — ②

b) Diagram — ①
 $\Delta = \frac{1}{2} bc \sin \theta$ — ①
 $\frac{dA}{dt} = \frac{1}{2} bc \cos \theta \frac{d\theta}{dt}$ — ①
 $= \frac{1}{2} \times 5 \times 4 \times \cos \pi/3 \times 0.06$ — ①
 $= 0.3 \text{ m}^2/\text{sec}$ — ①

45) a) $SD = a(1-e)$
 $= 28.584 \text{ million miles}$ — ②
 $LD = a(1+e)$
 $= 43.416 \text{ million miles}$ — ②
 Diagram — ①

b)
 $\frac{\partial u}{\partial x} = y \cos xy$ — ①
 $\frac{\partial u}{\partial y} = x \cos xy$ — ①
 $\frac{\partial^2 u}{\partial x \partial y} = -xy \sin xy + \cos xy$ — ①
 $\frac{\partial^2 u}{\partial y \partial x} = -xy \sin xy + \cos xy$ — ①
 $\Rightarrow \frac{\partial^2 u}{\partial x \partial y} = \frac{\partial^2 u}{\partial y \partial x}$ — ①

46) Diagram — ①
 a)
 1) Domain, extent, intercepts, origin — ①
 2) Symmetry } — ①
 3) Asymptotes }
 4) Monotonicity — ①

5) Special points — ①

47)
 a) $x=1; dx=0.02$ — ①
 $dy = \left[\frac{1}{3x^{2/3}} + \frac{1}{4x^{3/4}} \right] dx$ — ①
 $y = x^{1/3} + x^{1/4}$ — ①
 $dy = 0.011$ — ①
 $\sqrt[3]{1.02} + \sqrt[4]{1.02} \approx 2.011$ — ①

b)
 $[A|b] = \begin{bmatrix} 1 & 1 & 1 & 6 \\ 0 & 1 & 2 & 4 \\ 0 & 0 & A-3 & \mu-10 \end{bmatrix}$ — ②
 i) $\mu = 3; \mu \neq 10$ — ①
 ii) $\mu \neq 3; \mu \in \mathbb{R}$ — ①
 iii) $\mu = 3; \mu = 10$ — ①

46)
 b) $y' = -2x e^{-x^2}$
 $y'' = 2e^{-x^2}(2x^2 - 1)$
 Let $y'' = 0 \Rightarrow x = \pm \frac{1}{\sqrt{2}}$
 $(-\infty, -1/\sqrt{2})$ +ve Con UP
 $(-1/\sqrt{2}, 1/\sqrt{2})$ -ve Con DOWN
 $(1/\sqrt{2}, \infty)$ +ve Con UP
 $(-1/\sqrt{2}, e^{-1/2}); (1/\sqrt{2}, e^{-1/2})$

S.No	Handling Teachers	Sign
01	Mrs. Lavanya Bala	
02	Mr. Mathan	
03	Mr. Harris	
04	Mrs. Purushothaman	
05	Mr. T. Venkatesan	
06	Mrs. Sundari	