

## Model Question Set - A

**Class:** Ten (10)

**Subject:** Optional Maths

**F.M.:** 100

**Time:** 3 hours

**P.M.:** 40

Attempt **all** the questions. All the **working** must be shown.

### Group 'A'

[10 × 1 = 10]

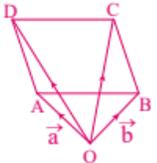
1. (a) Write the zero of polynomial  $2x + 3$ .  
 (b) There are  $n$  arithmetic means between  $a$  and  $l$ . If the common difference is  $d$  then write the last mean in terms of  $l$  and  $d$ .
2. (a) Write in words:  $\lim_{x \rightarrow a} f(x)$   
 (b) If matrix  $A = \begin{bmatrix} \sec \theta & \tan \theta \\ \tan \theta & \sec \theta \end{bmatrix}$ , what is the value of  $|A|$ ? Write it.
3. (a) Write the condition of perpendicular of a pair of lines represented by the homogeneous equation  $ax^2 + 2hxy + by^2 = 0$ .  
 (b) Which geometric figure will be formed when a plane intersects a cone parallel to its base? Write it.
4. (a) Express  $\sin^2 A$  in terms of  $\cos 2A$ .  
 (b) If  $\tan \theta = \sqrt{3}$  ( $0^\circ \leq \theta \leq 90^\circ$ ), what is the value of  $\theta$ ? Write it.
5. (a) Define the scalar product of two vectors.  
 (b)  $O$  is the center of the unit circle used in inversion transformation. If  $P'$  is the inversion point of the point  $P$ , express  $OP'$  in terms of  $OP$ .

### Group 'B'

[13 × 2 = 26]

6. (a) If  $f(x + 2) = x + 3$ , find  $ff(6)$ .  
 (b) Find the remainder by using synthetic division method when  $x^3 - 6x^2 + 11x + 7$  is divided by  $x - 2$ .

- (c) Find the vertex of parabola having equation:  
 $y = -4x^2 + 8x - 3$

7. (a) Show that the matrices  $\begin{bmatrix} 5 & -7 \\ 3 & -4 \end{bmatrix}$  and  $\begin{bmatrix} -4 & 7 \\ -3 & 5 \end{bmatrix}$  are inverses of each other.  
 (b) Find the value of  $x$  if  $\begin{vmatrix} x & 7x - 12 \\ 1 & x \end{vmatrix} = 0$
8. (a) Find the angle between the lines represented by:  
 $x^2 + 2xy \operatorname{cosec}^2 \theta + y^2 = 0$ .  
 (b) If  $3x^2 + 4kxy + y^2 = 0$  represents a pair of coincident lines, find the value of  $k$ .
9. (a) Prove that:  $\frac{1 + \sec \beta}{\sec \beta} = 2 \cos^2 \frac{\beta}{2}$ .  
 (b) Prove that:  $\sin(45^\circ + \theta) \sin(45^\circ - \theta) = \sin 30^\circ \cos 2\theta$   
 (c) If  $2 \cot \theta + 2 \cot \beta = \frac{1}{\sin \theta \sin \beta}$ , ( $0^\circ \leq \theta + \beta \leq 90^\circ$ ), find the value of  $\theta + \beta$ .
10. (a) Show that the scalar product of a vector with itself is equal to the square of its magnitude.  
 (b) In the given figure, ABCD is a parallelogram. If  $\vec{OA} = \vec{a}$ ,  $\vec{OB} = \vec{b}$ , and  $\vec{OC} = \vec{c}$ , find  $\vec{OD}$  in terms of  $\vec{a}$ ,  $\vec{b}$  and  $\vec{c}$ .  
  
 (c) If the lower quartile of a grouped data is 15 and the interquartile range is 30, then find the coefficient of quartile deviation.

### Group 'C'

[11 × 4 = 44]

11. Solve by using factor theorem:  
 $w^3 - 37w - 84 = 0$
12. A sum of Rs 700 is to be used to give seven cash prizes to students of a school for their overall academic performance. If each price is Rs 20 less than its preceding price, how much cash prize will the second topper student receive? Find it.

13. Test the continuity of the function:

$$f(x) = \begin{cases} 2 - x^2 & \text{for } x < 2 \\ x - 4 & \text{for } x = 2 \\ x - 3 & \text{for } x > 2 \end{cases}$$

at  $x = 2$  by using tabulation method.

14. Solve by Cramer's Rule:

$$3y - 7x = xy \text{ and } 5y - 4x = 17xy$$

15. Find the equation of circle passing through the point  $(-2,5)$  and the equations of whose two diameters are  $x - y + 2 = 0$  and  $y = 3x$ .

16. Prove that:

$$\sin \frac{11\beta}{4} \sin \frac{\beta}{4} + \sin \frac{7\beta}{4} \sin \frac{3\beta}{4} = \sin 90^\circ \sin 2\beta \sin \beta$$

17. If  $A + B + C = \frac{\pi^c}{2}$ , then prove that:

$$\sin^2 A + \sin^2 B + \sin^2 C = \tan 45^\circ - 4 \sin 30^\circ \sin A \sin B \sin C$$

18. The angles of depression of the top and the foot of a lamp post observed from the roof of a  $60\sqrt{3}$  m high house are found to be  $30^\circ$  and  $60^\circ$  respectively. Find the height of the lamp post and its distance from the house.

19. Prove by matrix method that the rotation of  $+90^\circ$  about origin followed by the reflection about  $y$ -axis is equivalent to the reflection about the line  $y = x$ .

20. Find mean deviation from mean and its coefficient from the data given below.

CI	0 - 10	0 - 20	0 - 30	0 - 40	0 - 40
f	2	5	10	14	15

21. Find the standard deviation and coefficient of variation from the given data.

CI	0 - 9	10 - 19	20 - 29	30 - 39	40 - 49
f	4	6	10	8	2

Group 'D'

[  $4 \times 5 = 20$  ]

22. Minimize  $P = 5x + 4y$  subject to the constraints:  
 $2x + y \leq 6$ ,  $3x + y \geq 6$  and  $x \leq 2$ .

23.  $P(4,9)$  and  $R(2,1)$  are two opposite vertices of rhombus  $PQRS$ . If the equation of diagonal  $QS$  is  $\frac{x}{a} + \frac{y}{b} = 1$ , find the value of  $a$  and  $b$ .

24. Prove by vector method that the diagonals of parallelogram  $ABCD$  bisect each other.

25.  $A(2,5)$ ,  $B(0,2)$  and  $C(-1,4)$  are the vertices of  $\Delta ABC$ . Find the image of  $\Delta ABC$  under reflection about the line  $y = x$  followed by reflection about the line  $y = 2$ . Represent both the object and images in the same graph. Which single transformation is equivalent to these two successive transformations?

♣♣♣ All The Best ♣♣♣