Class: Ten	Time: 3 Hours.	F.M.: 75
Subject: Opt. Mathematics		P.M.: 29

Attempt all questions.

Group A[10x1 = 10]

1. Write the period of the function $f(x) = sin x$.
2. Write the equation of boundary line of the inequality ax + by ≤ c.
3. Write the left hand limit of $f(x)$ at $x = a$ in mathematical statement.
4. If AB = BA= I then what types of matrices are A and B?
5. What is the angle between two straight lines x = 0 and y = 0?
6. The semi vertical angle of a cone is α and the angle made by the plane with the axis of cone is θ. If $\alpha = \theta$, what is the name of the conic section formed by the intersection of a plane surface and cone?
7. Write the formula of $cos A$ in terms of $sin \dfrac{A}{2}$.
8. Define angle of depression.
9. Write the formula to find the angle between vectors $\vec{a}$ and $\vec{b}$
10. If O is the centre of circle, radius = r and P' is inversion of point P, write down the relation of OP, OP' and r.

Group B[8x2 = 16]

11. When a polynomial $f(x) = x^3 - 3x^2 + kx + k$ is divided by $g(x) = x + 2$ then the remainder 5 is obtained. Using remainder theorem, find the value of k.
12. Find the vertex of the parabola $y = x^2 - 4x$.
13. If $\begin{bmatrix} x - 1 & 3 \\ x - 2 & 4 \end{bmatrix}$ is a singular matrix, find the value of x.
14. If the equation $(k^2 + 2)x^2 + 5xy - 3ky^2 = 0$ represents two perpendicular lines, find the value of k.
15. If $Sin\dfrac{A}{2} = \dfrac{1}{2}\left(t + \dfrac{1}{t}\right)$ then show that:
$$CosA = \dfrac{1}{2}\left(t^2 + \dfrac{1}{t^2}\right) = 0$$
16. Solve: $tan x + cot x = 2.$ $\qquad$ (0° ≤ x ≤ 90°)
17. If $\vec{a} = p\vec{i} + 3\vec{j}, \vec{b} = 5\vec{i} - \vec{j}$ and $\vec{a} . \vec{b} = 7$, find the value of p.
18. The inter-quartile range of a continuous data is 30 and upper quartile is 40. What is the value of quartile deviation and coefficient of quartile deviation?

Group C[11x3 = 33]

19. The image of a function f is 4 times of its pre-image plus 5. The image of composite function of g and f is 8 times

of its pre image plus 13. If $g_o f(x) = 28$, find is the value of x.

20. Solve graphically: $x^2 + 2x - 3 = 0$.
21. Examine the continuity or discontinuity of
$$f(x) = \begin{cases} 4x - 1 & \text{if } x < 1 \\ 7x & \text{if } x \geq 1 \end{cases} \text{ at } x = 1 \text{ by calculating left}$$
hand limit, right hand limit and functional values.
22. If the men are sitting on the chair in a hall. The sum of legs of men and legs of chairs is 102 and 3 chairs are empty. Find the number of men and number of chairs by making linear equation and by using matrix method.
23. A (3, 5) and C (7, 9) are the opposite vertices of a rhombus ABCD, find the equation of the diagonal BD.
24. Prove that:
$$\frac{1 - cosA + cosB - cos(A + B)}{1 + cosA - cosB - cos(A - B)} = tan\frac{A}{2} . cot\frac{B}{2}$$
25. If $A + B + C = 90°$ then prove that:
$sinA . cosA + sinB . cosB + sinC . cosC = 2cosA . cosB . cosC$
26. A ladder 10 m long reaches a point 10 m below the top of a vertical flagstaff. From the foot of the ladder, the elevation of the flagstaff is 60°. Find the height of the flagstaff.
27. $\triangle$ABC with the vertices A(3, 6), B(4, 2) and C(3, 3) is mapped onto $\triangle$A'B'C' such that A' (6, –3), B'(2, – 4) and C'(3, –3). Find the 2×2 transformation matrix that represents this transformation. Also, which is the single transformation for this mapping?
28. Find the mean deviation from mean and its coefficient

Age(In years)	0-4	4-8	8-12	12-16	16-20
No. Of Boys(f)	12	8	10	6	4

29. Compute the standard deviation from the data given below.

Class	0-10	10-20	20-30	30-40	40-50	50-60	60-70
Frequency	1	4	17	45	26	5	2

Group D[4x4 = 16]

30. The minimum value of objective function F = 6x + 10y + k subject to constraints 5x + 2y ≤ 10, 3x + 5y ≤ 15, x ≥ 0, y ≥ 0 is 20, find the value of k.
31. Find the equation of the circle which passes through the pints (1, 1), (4, 4) and (5, 1).
32. Prove by vector method: The diagonals of rhombus bisect to each other at right angle.
33. A quadrilateral having vertices P(0, 3), Q(–6, 1), R(–6, 5) and S(–1, 5) is reflected in the line y = x followed by rotation about origin through +90o . Find the coordinates of image of quadrilateral PQRS. Also present the object and final image on same graph paper.

THE END