SEE MODEL QUESTION SET

Class: 10 Full Marks: 100
Subject: Opt. Mathematics Time: 3 hours

Attempt all the questions.

Group: 'A' $[16\,2=16]$

1. a. If $f^{-1}(x)=3x+2$, find $f(x)$.
   b. State remainder theorem. For what value of $K, f(x)=3x^3+3x+K$ and $f(-1)=0$.
2. a. In the sequence 5, 9, 13, 17, ….., which term will be 101?
   b. If $\begin{bmatrix}2 & 0\\ 0 & -3\end{bmatrix}\begin{bmatrix}x\\ y\end{bmatrix}=\begin{bmatrix}-6\\ -3\end{bmatrix}$, find the matrix $\begin{bmatrix}x\\ y\end{bmatrix}$.
3. a. For what value of x the matrix $\begin{bmatrix}6 & 9\\ 2 & x\end{bmatrix}$ does not have its inverse.
   b. Find he acute angle between the pair of lines $2x+y+3=0$ and $3x-y+8=0$.
4. a. For what value of 'a' so that the two lines represented by $(a+1)x^2-12xy+9y^2=0$ are coincident.
   b. Find the centre and radius of a circle having equation $2x^2-2y^2-8x-4y-8=0$.
5. a. Show that: $\cos 15^0-\sin 15^0=\frac{1}{\sqrt{2}}$
   b. Prove that: $sinA.\cos 2A=\frac{\sin 4A.secA}{4}$
6. a. Prove that: $\frac{1-cosA+sinA}{1+cosA+sinA}=\tan\frac{A}{2}$
   b. Solve: $2\cos^2 A+\sqrt{3}cosA=0\,(0^0\le A\le 180^0)$
7. a. If $(\vec{a}+3\vec{b})$ and $(\vec{a}-4\vec{b})$ are perpendicular to each other and $\vec{a}$ and $\vec{b}$ are unit vecotrs, find the angle between $\vec{a}$ and $\vec{b}$.
   b. If position vectors of A and B are $2\vec{i}+\vec{j}$ and $6\vec{i}+3\vec{j}$ respectively, find the position vector of the midpoint of AB.
8. a. If a point P(a, b) is first reflected in $y=x$ line and image so formed is reflected in the y-axis, then final image P"(-2, 3) is formed, find P(a, b).
   b. What transformation is represented by the matrix $\begin{pmatrix}3 & 0\\ 0 & 3\end{pmatrix}$? Transform the point (5, 6) using this matrix.

Group: 'B' $[17\,4=64]$

9. If $f(x)=2x-5, g(x)=\frac{3x+5}{2}$ and $ff(x)=g^{-1}(x)$, find the value of x.
10. Solve: $x^3-6x^2+11x-6=0$
11. The sum of the first 4 terms of a G.P. is 30 and the sum of the last four terms is 960. If first and last terms are 2 and 512 respectively, calculate the common ratio and 6th term.
12. Solve graphically: $x^2-5x+6=0$
13. Solve by matrix method: $2x-y=1$
    $x+2y=8$
14. Find the equations of lines through the point (1, -4) and making an angle of 45^0 with the line $2x+3y+5=0$.
15. Find the equations of the pair of lines passing through the origin and perpendicular to the lines represented by $3x^2+xy-10y^2=0$.
16. Find the equation of the circle having the centre as the point of intersection of the lines $x-y=4$ and $2x+3y+7=0$ and passing through the point (2, 4).
17. Prove that: $cosec\,2A+cosec\,4A=cotA-\cot 4A$
18. If A+B+C=180^0, show that $\sin 2A+\sin 2B+\sin 2C=4\,sinAsinBsinC$.
19. Solve: $sin\theta+cos\theta=1\,for\,(0\le\theta\le 360^0)$
20. Two boys are on opposite sides of a tower which is 80 m high. They observe that the angles of elevation of the top of the tower are 30^0 and 60^0 respectively. Find the distance between boys.
21. Prove by vector method that the angle in the semicircle is a right angle.
22. The vertices of ΔABC are A(2, 5), B(-1, 3) and C(4, 1). ΔABC is rotated through -90^0 about (0, 0) and the image so obtained is enlarged by taking (0, 0) as centre and scale factor 2. Find the coordinates of images of ΔABC and show the object and images on the same graph.
23. Find 2×2 transformation matrix which transform a unit square $\begin{pmatrix}0 & 1 & 1 & 0\\ 0 & 0 & 1 & 1\end{pmatrix}$ into parallelogram $\begin{pmatrix}0 & 3 & 5 & 2\\ 0 & 1 & 2 & 1\end{pmatrix}$.
24. Find mean deviation from mean and its coefficient.

x	10	15	20	25	30
f	4	5	7	9	5

25. Find standard deviation and coefficient of variation from the following data:

x	0-4	4-8	8-12	12-16
f	2	6	10	14