Symbol No..... RE - 231'B'

SEE 2078(2022)

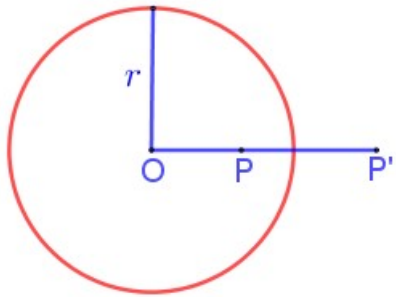
Subject: Additional Mathematics

Time: 3: 00 hrs **F.M.:** 100

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

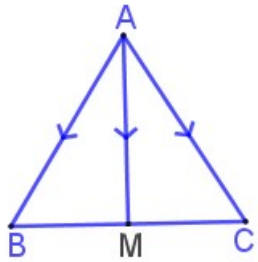
Group 'A' $[5 \times (1+1) = 10]$

1. (a) If $f(x), q(x), d(x)$ and $r(x)$ represent polynomial, quotient, divisor and remainder respectively, write the relation among them.
   (b) What is the geometric mean between two positive numbers m and n? Write it.
2. (a) Express in words : $\lim_{x \to a^-} f(x)$
   (b) If matrix $M = \begin{bmatrix} a & -b \\ c & a \end{bmatrix}$, What is the value of $|M|$? Write it.
3. (a) Write the condition of coincident of a pair of lines represented by the equation $ax^2 + 2hxy + by^2 = 0$.
   (b) Which geometric figure will be formed when a plane intersects a cone parallel to the generator ? Write it.
4. (a) Write $\cos 2A$ in terms of $\tan A$.
   (b) If $\cos A = 0.5 \quad (0^\circ < A < 90^\circ)$, what is the value of A? Write it.
5. (a) If $\vec{a} = (x_1, y_1)$ and $\vec{b} = (x_2, y_2)$, write the value of $\vec{a}.\vec{b}$
   (b) In the given figure, O is the centre of inversion circle and r is the radius. If P' is the inversion point of the point P, write the relation among OP, OP' and r



Group 'B' $[13 \times 2 = 26]$

6. (a) If $f(x) = 3x + a$ and $ff(6) = 10$, find the value of a.
   (b) If the polynomial $x^3 - 6x^2 + 11x - p$ is divided by $(x-2)$, the remainder is -4, find the value of p using remainder theorem.
   (c) Find the vertex of the parabola having equation $y = 2x^2 + 4x + 3$.
7. (a) If $A = \begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix}, B = \begin{bmatrix} 2 & m \\ -1 & 2 \end{bmatrix}$ and $AB = I$ where I is an 2×2 identity matrix, then find the value of m.
   (b) If the sum of two numbers is 16 and their differcnce is 4, express those equations in matrix form.
8. (a) Find the equations of a pair of lines represented by the equation $x^2 - 2x - 2y - y^2 = 0$.
   (b) Find the obtuse angle between a pair of straight lines represented by an equation $x^2 - 4xy + y^2 = 0$.
9. (a) Prove that: $\sqrt{1 + \sin\theta} = \cos\frac{\theta}{2} + \sin\frac{\theta}{2}$
   (b) Prove that: $\sin 105^\circ . \cos 15^\circ = \frac{1}{4}\left(2 + \sqrt{3}\right)$
   (c) If $\cos 3\theta - \sin 2\theta = 0$, find the value of θ under $0^\circ \le \theta \le 90^\circ$.
10. (a) If $(\vec{a} + \vec{b})^2 = (\vec{a} - \vec{b})^2$, prove that $\vec{a} \perp \vec{b}$.
    (b) In the adjoining figure, M is the mid point of BC, prove that: $\frac{1}{2}\left(\overrightarrow{AB} + \overrightarrow{AC}\right) = \overrightarrow{AM}$



    (c) In the first quartile of a grouped data is 15 and the quartile deviation is 30, then find the coefficient of the quartile deviation.

Group 'C' $[11 \times 4 = 44]$

11. Solve by using factor theorem $2x^3 - 3x^2 - 11x + 6 = 0$.

12. The students of class ten of a certain school collected a sum of Rs. 2750 from the some arts of the amounts they had brought for tiffin. It was planned to distribute cash prizes from the collected amount for the first ten students who secured distinct marks in the exam. If each cash prize is Rs. 50 less than the preceeding prizes, how much cash prize will the topper student receive ? Find it.

13. Prove that the function

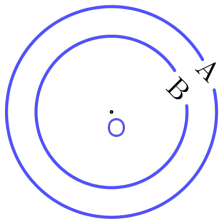
$$f(x) = \begin{cases} 2x-1 & \text{for } x < 2 \\ 3 & \text{for } x = 2 \\ x+1 & \text{for } x > 2 \end{cases} \quad \text{at } x = 2$$

is continuous at the point $x = 2$.

14. Solve by Cramer's rule

$$\frac{6}{y} + \frac{10}{x} = 3; \quad \frac{3}{y} - \frac{21}{x} = -5$$

15. In the given figure, A and B are two concentric circles. If the equation of circle A is $x^2 + y^2 + 4x - 6y - 3 = 0$ and radius of circle B is 2 units, find the equation of circle B.



16. Prove that: $\tan 45^\circ \sec 40^\circ + \tan 60^\circ \operatorname{cosec} 40^\circ = 4$

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

$$\cos^2 A + \cos^2 B + \cos^2 C = 2 + 2 \sin A . \sin B . \sin C$$

18. From the roof of a house 40 m high, the angles of elevation and depression of the top and foot of a tower are found to be 60° and 30° respectively. Find the height of the tower and the distance between the house and the tower.

19. Find a 2×2 transformation matrix which transforms the quadrilateral $\begin{pmatrix} 0 & -1 & -1 & 0 \\ 0 & 0 & 1 & 1 \end{pmatrix}$ into the quadrilateral $\begin{pmatrix} 0 & 3 & 4 & 1 \\ 0 & 3 & 4 & 1 \end{pmatrix}$.

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

Marks obtained	10 - 20	20 - 30	30 - 40	40 - 50	50 -60
No. of Students	5	4	5	4	2

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

Age in years	0 - 4	4 - 8	8 - 12	12 - 16	16 - 20	20 - 24
No. of Students	7	7	10	15	7	6

Group 'D' $[4 \times 5 = 20]$

22. Find the minimum value of the objective function $P = 3x + 4y$ under the given constraints.

$$x + y \geq 6, y \leq x \text{ and } x \leq 6$$

23. The co-ordinates of the vertices P, Q and R of ΔPQR are $(3, 4), (1, 1)$ and $(6, 2)$ respectively. If PS is the altitude of ΔPQR, find the co-ordinates of the point S.

24. In ΔABC, $\angle$ABC $= 90^\circ$ and O is the mid-point of side AC, then prove by vector method that: OA = OB = OC.

25. E denotes the enlargement about the centre $(3, 1)$ with a scale factor of 2 and R denotes the reflection on the line $y = x$. Find the image of ΔABC having the vertices $A(2, 3), B(4, 5)$ and $C(1, -2)$ under the combined transformation EoR. Draw both ΔABC and image $\Delta A'B'C'$ on the same graph paper.

All The Best