



Total No. of Questions – 24 Regd.

Total No. of Printed Pages – 4 No.

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Part - III
MATHEMATICS, Paper-II(B)
(English Version)

Time : 3 Hours]

[Max. Marks : 75

Note : This question paper consists of **three** sections A, B and C.

SECTION - A

10 × 2 = 20

I. Very short answer type questions :

- (i) Attempt **all** questions.
- (ii) Each question carries **two** marks.

1. Find the value of 'a' if $2x^2 + ay^2 - 3x + 2y - 1 = 0$ represents a circle. Also find radius of circle.
2. Find the power of point P(5, -6) with respect to the circle $S = x^2 + y^2 + 8x + 12y + 15 = 0$.
3. Find k, if the circles $x^2 + y^2 - 6x - 8y + 12 = 0$, $x^2 + y^2 - 4x + 6y + k = 0$ are orthogonal.
4. Find coordinates of points on the parabola $y^2 = 8x$ whose focal distance is 10.
5. Define Rectangular hyperbola and find its eccentricity.

6. Evaluate : $\int \frac{1}{\cosh x + \sinh x} dx$ on $x \in \mathbb{R}$.

7. Evaluate : $\int x \log x dx$ on $(0, \infty)$

8. Evaluate : $\int_1^5 \frac{dx}{\sqrt{2x-1}}$

9. Find $\int_0^{\pi/2} \sin^4 x \cos^5 x dx$

10. Find the general solution of $\frac{dy}{dx} = \frac{2y}{x}$

SECTION - B

5 × 4 = 20

II. Short answer type questions :

- (i) Attempt any **five** questions.
- (ii) Each question carries **four** marks.

11. Find the length of chord intercepted by the circle

$$x^2 + y^2 - 8x - 2y - 8 = 0 \text{ on the line } x + y + 1 = 0$$

12. Find radical centre of the circles

$$x^2 + y^2 + 4x - 7 = 0, 2x^2 + 2y^2 + 3x + 5y - 9 = 0, x^2 + y^2 + y = 0$$

13. Find eccentricity, coordinates of foci, length of latus rectum and equations of directrices for the ellipse $9x^2 + 16y^2 = 144$.

14. A man running on a race course notices that sum of distances of two flag posts from him is always 10 m. and distance between flag posts is 8 m. Find the equation of race course traced by the man.
15. Find equations of tangents to the hyperbola $x^2 - 4y^2 = 4$ which are
(i) parallel to (ii) perpendicular to the line $x + 2y = 0$.
16. Evaluate : $\int_0^{\pi/2} \frac{a \sin x + b \cos x}{\sin x + \cos x} dx$.
17. Solve : $\frac{dy}{dx} = \frac{(x+y)^2}{2x^2}$.

SECTION - C

5 × 7 = 35

III. Long answer type questions :

- (i) Attempt any **five** questions.
- (ii) Each question carries **seven** marks.
18. Show that the four points (1, 1), (-6, 0), (-2, 2), (-2, -8) are concyclic and find the equation of the circle on which they lie.
19. (a) Find pole of $3x + 4y - 45 = 0$ with respect to $x^2 + y^2 - 6x - 8y + 5 = 0$.
(b) Find the locus of P, if the tangents drawn from P to $x^2 + y^2 = a^2$ are perpendicular to each other.
20. Prove that the area of the triangle inscribed in the parabola $y^2 = 4ax$ is $\frac{1}{8a} |(y_1 - y_2)(y_2 - y_3)(y_3 - y_1)|$ sq. units where y_1, y_2, y_3 are ordinates of its vertices.

21. Evaluate : $\int \frac{9 \cos x - \sin x}{4 \sin x + 5 \cos x} dx$.

22. Obtain the reduction formula for $I_n = \int \cot^n x dx$, n being a positive integer, $n \geq 2$ and deduce the value of $\int \cot^4 x dx$.

23. Evaluate : $\int_0^1 \frac{\log(1+x)}{1+x^2} dx$.

24. Solve the Differential Equation

$$\cos x \cdot \frac{dy}{dx} + y \sin x = \sec^2 x.$$