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II

Total No. of Questions – 24 **Regd. No.**
Total No. of Printed Pages – 4

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 $x \in R$.

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

8. Evaluate : $\int \frac{dx}{\sqrt{2x - 1}}$

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

$5 \times 4 = 20$

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

$x^2 + y^2 - 8x - 2y - 8 = 0$ 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

$5 \times 7 = 35$

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 In = $\int \cot^n x\,dx$, n being a positive integer, n ≥ 2 and deduce the value of $\int \cot^4 x\,dx$.

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

24. Solve the Differential Equation

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