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Total No. of Questions – 24

Total No. of Printed Pages - 3

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

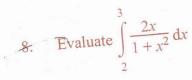
Time: 3 Hours

[Max. Marks: 75

Note: This question paper consists of three Sections - A, B and C.

 $10 \times 2 = 20$

- I. Very Short Answer Type questions.
 - (i) Attempt all questions.
 - (ii) Each question carries two marks.
 - Find the power of the point P(-1, 1) with respect to the circle $x^2 + y^2 6x + 4y 12 = 0$
 - 2. Find the value of k, if the points (1, 3) and (2, k) are conjugate with respect to the circle $x^2 + y^2 = 35$.
 - Find the value of k, if the circles $x^2 + y^2 + 4x + 8 = 0$ and $x^2 + y^2 16y + k = 0$ are orthogonal.
 - Find the value of k, if the line 2y = 5x + k is a tangent to the parabola $y^2 = 6x$.
 - Find the equation of the hyperbola whose foci are (± 5, 0), the transverse axis is of length 8.
 - 6. Evaluate $\int \sqrt{x} \log x \, dx$ on $(0, \infty)$
 - 7. Evaluate $\int \sec^2 x \cdot \csc^2 x \, dx$ on $I \subset \mathbb{R} \setminus \left(\left\{ n\pi : n \in Z \right\} \cup \left\{ (2n+1) \frac{\pi}{2} : n \in Z \right\} \right)$



9. Evaluate
$$\int_{0}^{a} \sqrt{a^2 - x^2} \, dx$$

10. Form the differential equation corresponding to the family of curves $y = c(x-c)^2$, where c is a parameter.

 $5\times 4=20$

- II. Short Answer Type questions.
 - (i) Attempt any five questions.
 - (ii) Each question carries four marks
 - Find the length of the chord intercepted by the circle $x^2 + y^2 8x 2y 8 = 0$ on the line x + y + 1 = 0.
 - 12. If the two circles $x^2 + y^2 + 2gx + 2fy = 0$ and $x^2 + y^2 + 2g'x + 2f'y = 0$ touch each other, then show that f'g = fg'.
 - Find the eccentricity, foci, length of the Latus rectum and the equations of directrices of the ellipse $9x^2 + 16y^2 = 144$.
 - 14. Find the equations of tangent and normal to the ellipse $2x^2 + 3y^2 = 11$ at the point whose ordinate is 1.
 - 15. Prove that the point of intersection of two perpendicular tangents to the hyperbola $\frac{x^2}{a^2} \frac{y^2}{b^2} = 1$ lies on the circle $x^2 + y^2 = a^2 b^2$.
 - 16. Find the area of the region enclosed by the curves $y = 4x x^2$, y = 5 2x.
 - 17. Solve the differential equation $\frac{dy}{dx} + y \tan x = \sin x$.

293/7

III. Long Answer Type questions.

- (i) Attempt any five questions.
- (ii) Each question carries seven marks.
- Find the equation of the circle passing through the three points (1, 2), (3, -4), (5, -6)
- Find the pair of tangents drawn from (1, 3) to the circle $x^2 + y^2 2x + 4y 11 = 0$ and also find the angle between them.
- 20. Show that the equation of the parabola in standard form is $y^2 = 4ax$.

21. Evaluate
$$\int \frac{2\sin x + 3\cos x + 4}{3\sin x + 4\cos x + 5} dx$$

22. Obtain the reduction formula for $I_n = \int \csc^n x \, dx$, n being a positive integer, $n \ge 2$ and hence deduce the value of $\int \csc^5 x \, dx$.

23. Evaluate
$$\int_{0}^{\pi} \frac{x \sin x}{1 + \sin x} dx =$$

24. Solve the differential equation

$$\frac{\mathrm{dy}}{\mathrm{dx}} = \frac{3y - 7x + 7}{3x - 7y - 3}$$