

Total No. of Questions - 24

Regd.
No.

--	--	--	--	--	--	--	--	--	--

Total No. of Printed Pages - 4

Part - III

MATHEMATICS, Paper - II (B)
(Coordinate Geometry and Calculus)
(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.

- Attempt all questions.
- Each question carries two marks.

- Find the equation of the circle whose extremities of a diameter are $(-4, 3)$, $(3, -4)$.
- Find the Polar of $(3, -1)$ with respect to $2x^2 + 2y^2 = 11$.
- Find the equation of the radical axis of the circles $x^2 + y^2 + 4x + 6y - 7 = 0$, $4(x^2 + y^2) + 8x + 12y - 9 = 0$.
- Find the equation of the parabola whose vertex is $(3, -2)$ and focus is $(3, 1)$.

5. Find the product of lengths of the perpendiculars from any point on the hyperbola $\frac{x^2}{16} - \frac{y^2}{9} = 1$ to its asymptotes.

6. Evaluate $\int \frac{x^8}{1+x^{18}} dx$ on R .

7. Evaluate $\int e^x \left(\frac{1+x \operatorname{Log} x}{x} \right) dx$ on $(0, \infty)$

8. Evaluate $\int_0^a \frac{dx}{x^2 + a^2}$

9. Find the area bounded between the curves $y = x^2$, $y = x^3$.

10. Solve $\frac{dy}{dx} = \frac{1+y^2}{1+x^2}$.

II. Short Answer Type Questions.

- i) Attempt any five questions.
 - ii) Each question carries four marks.
11. Find the equation of the tangent at the point 30° (parametric value of θ) of the circle $x^2 + y^2 + 4x + 6y - 39 = 0$.
12. Find the equation of the circle which passes through the point $(2, 0)$, $(0, 2)$ and orthogonal to the circle $2x^2 + 2y^2 + 5x - 6y + 4 = 0$.
13. Find the length of the major axis, minor axis, latus rectum, eccentricity of the ellipse $9x^2 + 16y^2 = 144$.
14. Find the equation of the tangent to the ellipse $2x^2 + y^2 = 8$ which are i) parallel to $x - 2y - 4 = 0$ ii) perpendicular to $x + y + 2 = 0$.
15. Tangents to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ makes angles θ_1, θ_2 with transverse axis of a hyperbola. Show that the point of intersection of these tangents lies on the curve $2xy = k(x^2 - a^2)$ when $\tan \theta_1 + \tan \theta_2 = k$.
16. Find the area bounded between the curves $y^2 = 4x$, $y^2 = 4(4 - x)$.
17. Solve $\frac{dy}{dx} - y \tan x = e^x \sec x$.

III. Long Answer Type Questions.

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

18. Find the equation of a circle which passes through $(2, -3)$, and $(-4, 5)$ and having the centre on $4x + 3y + 1 = 0$.

19. Find the transverse common tangents of the circles $x^2 + y^2 - 4x - 10y + 28 = 0$ and $x^2 + y^2 + 4x - 6y + 4 = 0$.

20. Show that the equation of common tangents to the circle $x^2 + y^2 = 2a^2$ and the parabola $y^2 = 8ax$ are $y = \pm(x + 2a)$.

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

22. Obtain the reduction formula for $I_n = \int \cos^n x \, dx$, n being a positive integer $n \geq 2$, and deduce the value of $\int \cos^3 x \, dx$.

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

24. Solve $\frac{dy}{dx} = \frac{4x + 6y + 5}{3y + 2x + 4}$.