

0293

TS



Total No. of Questions – 24

Total No. of Printed Pages - 4

Regd.

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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. Obtain the parametric equation of the circle $4(x^2 + y^2) = 9$.
2. Find the value of k , if the points $(4, 2)$ and $(k, -3)$ are conjugate points with respect to the circle $x^2 + y^2 - 5x + 8y + 6 = 0$.
3. Find the angle between the circles given by the equations $x^2 + y^2 - 12x - 6y + 41 = 0$,
 $x^2 + y^2 + 4x + 6y - 59 = 0$.
4. Find the coordinates of the points on the parabola $y^2 = 8x$ whose focal distance is 10.
5. If $3x - 4y + k = 0$ is a tangent to the hyperbola $x^2 - 4y^2 = 5$ find the value of k .

6. Evaluate $\int \frac{1}{\cos hx + \sin hx} dx$ on \mathbb{R} .

7. Evaluate $\int \frac{e^x(1+x)}{\cos^2(xe^x)} dx$ on $I \subset \mathbb{R} \setminus \{x \in \mathbb{R} : \cos(xe^x) = 0\}$

8. Evaluate $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \sin |x| dx$.

9. Evaluate $\int_0^3 \frac{x}{\sqrt{x^2 + 16}} dx$.

10. Find the order of the differential equation of the family of all the circles with their centres at the origin.

SECTION - B

5 × 4 = 20

II. Short Answer Type questions.

(i) Attempt any **five** questions.

(ii) Each question carries **four** marks.

11. If a point P is moving such that the lengths of tangents drawn from P to the circles $x^2 + y^2 - 4x - 6y - 12 = 0$ and $x^2 + y^2 + 6x + 18y + 26 = 0$ are in the ratio 2 : 3 then find the equation of the locus of P.

12. Find the equation and the length of the common chord of the following circles :

$$x^2 + y^2 + 2x + 2y + 1 = 0; x^2 + y^2 + 4x + 3y + 2 = 0$$

13. Find the equation of ellipse in the standard form, if it passes through the points $(-2, 2)$ and $(3, -1)$.
14. Find the equation of the tangents to the ellipse $2x^2 + y^2 = 8$ which are
- parallel to $x - 2y - 4 = 0$
 - perpendicular to $x + y + 2 = 0$
15. If e, e_1 are the eccentricities of a hyperbola and its conjugate hyperbola prove that $\frac{1}{e^2} + \frac{1}{e_1^2} = 1$.
16. Find the area of the region bounded by the parabolas $y^2 = 4x$ and $x^2 = 4y$.
17. Solve the following differential equation $(x + y + 1) \frac{dy}{dx} = 1$.

SECTION - C

5 × 7 = 35

III. Long Answer Type questions.

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

18. If $(2, 0), (0, 1), (4, 5)$ and $(0, c)$ are concyclic then find c .
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. Derive the equation of a parabola in the standard form $y^2 = 4ax$ with diagram.

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

22. If $I_n = \int \cos^n x dx$, then show that $I_n = \frac{1}{n} \cos^{n-1} x \sin x + \frac{n-1}{n} I_{n-2}$ and for $n \geq 2$

deduce the value of $\int \cos^4 x dx$.

23. Show that $\int_0^{\frac{\pi}{2}} \frac{x}{\sin x + \cos x} dx = \frac{\pi}{2\sqrt{2}} \log(\sqrt{2} + 1)$.

24. Solve the differential equation $(x - y)dy = (x + y + 1)dx$.
