Total No. of Questions – 24

Total No. of Printed Pages - 3

Regd. No. ☐☐☐☐☐☐☐☐☐☐

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 (

SECTION – A   10 × 2 = 20

I.   Very Short Answer Type questions.

     (i)   Attempt **all** questions.

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

1.   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 $x^2 + y^2 = 35$.

3.   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.

4.   Find the value of k, if the line $2y = 5x + k$ is a tangent to the parabola $y^2 = 6x$.

5.   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, ∞)

7.   Evaluate $\int \sec^2 x . \operatorname{cosec}^2 x \, dx$ on $I \subset R \setminus \left(\{n\pi : n \in Z\} \cup \left\{ (2n + 1)\dfrac{\pi}{2} : n \in Z \right\} \right)$

8. Evaluate $\displaystyle\int_{2}^{3} \frac{2x}{1 + x^2}\, dx$

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

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

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 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 $f'g = fg'$.

13. 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 $\dfrac{x^2}{a^2} - \dfrac{y^2}{b^2} = 1$ 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 $\dfrac{dy}{dx} + y \tan x = \sin x$.

SECTION – C

5 × 7 = 35

III. Long Answer Type questions.

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

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

18. Find the equation of the circle passing through the three points $(1, 2)$, $(3, -4)$, $(5, -6)$

19. 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 $\int \dfrac{2 \sin x + 3 \cos x + 4}{3 \sin x + 4 \cos x + 5} dx$

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

23. Evaluate $\displaystyle\int_0^{\pi} \dfrac{x \sin x}{1 + \sin x} dx$

24. Solve the differential equation

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