0293
TS

C

Total No. of Questions – 24

Total No. of Printed Pages - 4

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 **C**.

SECTION – A $10 \times 2 = 20$

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 R.

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

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

$5 \times 4 = 20$

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

(i) parallel to $x - 2y - 4 = 0$

(ii) 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 $5 \times 7 = 35$

III. Long Answer Type questions.

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

(ii) 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 $(x - y)dy = (x + y + 1)dx$.
