

Total No. of Questions 37 Regd.

Total No. of Printed Pages 4 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 × 2 = 20**

**I. Very Short Answer Type questions.**

(i) Answer any **ten** questions.

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

1. Find the equation of the circle passing through (2, -1) having the centre at (2, 3).

2. If  $x^2 + y^2 - 4x + 6y + c = 0$  represents a circle with radius 6, then find the value of c.

3. Find the value of k if the points (1, 3) and (2, k) are conjugate with respect to the circle  $x^2 + y^2 = 35$ .

4. Find the chord of contact of (0, 5) with respect to the circle  $x^2 + y^2 - 5x + 4y - 2 = 0$ .

5. Find the angle between the circles  $x^2 + y^2 + 6x - 10y - 135 = 0$  and  $x^2 + y^2 - 4x + 14y - 116 = 0$ .

6. Find the common tangent of the circles  $x^2 + y^2 + 10x - 2y + 22 = 0$  and  $x^2 + y^2 + 2x - 8y + 8 = 0$  at their point of contact.
7. Find the equation of the parabola whose vertex is  $(3, -2)$  and focus is  $(3, 1)$ .
8. If the eccentricity of a hyperbola is  $\frac{5}{4}$ , then find the eccentricity of its conjugate hyperbola
9. Evaluate  $\int \left[ \frac{1}{1-x^2} + \frac{1}{1+x^2} \right] dx$  on  $(-1, 1)$ .
10. Evaluate  $\int (x^3 - 2x^2 + 3) dx$  on  $\mathbb{R}$ .
11. Evaluate  $\int \frac{e^{\tan^{-1} x}}{1+x^2} dx$  on  $I \subset (0, \infty)$ .
12. Evaluate  $\int \frac{3x^2}{1+x^6} dx$  on  $\mathbb{R}$ .
13. Evaluate  $\int_0^5 (x+1) dx$ .
14. Evaluate  $\int_0^\pi \sqrt{2+2\cos \theta} d\theta$ .
15. Find the order and degree of the differential equation

$$\frac{d^2 y}{dx^2} = \left[ 1 + \left( \frac{dy}{dx} \right)^2 \right]^{\frac{2}{3}}$$

## SECTION - B

**5 × 4 =**

### I. Short Answer Type questions

- (i) Answer any **five** questions.
- (ii) Each question carries **four** marks.

16. If the length of the tangent from (2, 5) to the circle  $x^2 + y^2 - 5x + 4y + k = 0$  is  $\sqrt{37}$  then find  $k$ .
17. Find the pole of  $3x + 4y - 45 = 0$  with respect to  $x^2 + y^2 - 6x - 8y + 5 = 0$ .
18. Find the angle between the tangents drawn from (3, 2) to the circle  $x^2 + y^2 - 6x + 4y - 2 = 0$ .
19. Find the equation of the circle which cuts orthogonally the circle  $x^2 + y^2 - 4x + 2y - 7 = 0$  and having the centre at (2, 3).
20. Show that the circles  $x^2 + y^2 - 8x - 2y + 8 = 0$  and  $x^2 + y^2 - 2x + 6y + 6 = 0$  touch each other and find the point of contact.
21. Find the equation of ellipse in the standard form if it passes through the points (-2, 2) and (3, -1).
22. Find the equation of ellipse in the standard form whose distance from foci is 2 and the length of latus rectum is  $\frac{15}{2}$ .

## SECTION - C

**5 × 1**

### III. Long Answer Type questions.

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

25. Find the equation of the circle passing through the points (3, 2) and (1, 4).
26. Solve the differential equation  $\frac{dy}{dx} = \frac{xy + y}{xy + x}$ .
27. Solve the differential equation  $\frac{dy}{dx} = e^{x-y} + x^2 e^{-y}$ .

## SECTION - C

### III. Long Answer Type questions.

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

28. Find the equation of the circle passing through the points (3, 4), (3, 2) and (1, 4).
29. Find the length of the chord intercepted by the circle  $x^2 + y^2 - x + 3y - 22 = 0$  on the line  $y = x - 3$ .
30. Find the equation of the circle which touches the circle  $x^2 + y^2 - 2x - 4y - 20 = 0$  externally at (5, 5) with radius 5.
31. Find the equation of the circle passing through origin, having its centre on the line  $x + y = 4$  and intersecting the circle  $x^2 + y^2 - 4x + 2y + 4 = 0$  orthogonally.
32. Derive the equation of the parabola in standard form.
33. Evaluate  $\int \frac{(a^x - b^x)^2}{a^x b^x} dx$ , ( $a > 0, a \neq 1, b > 0, b \neq 1$ ) on  $\mathbb{R}$ .
34. Evaluate  $\int \frac{1}{(x+3)\sqrt{x+2}} dx$  on  $I \subset (-2, \infty)$
35. Evaluate  $\int \frac{dx}{\cos^2 x + \sin 2x}$  on  
 $I \subset \mathbb{R} - \left\{ (2n+1)\frac{\pi}{2}, n \in \mathbb{Z} \right\} \cup \left\{ 2n\pi + \tan^{-1} \frac{1}{2}, n \in \mathbb{Z} \right\}$ .
36. Evaluate  $\int_0^{\frac{\pi}{4}} \log(1 + \tan x) dx$ .
37. Solve the differential equation  $\frac{dy}{dx} = \tan^2(x+y)$ .