

Total No. of Questions – 24

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Total No. of Printed Pages – 3

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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. If  $x^2 + y^2 + 2gx + 2fy - 12 = 0$  represents a circle with centre (2, 3) find g, f and its radius.
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 angle between the circles

$$x^2 + y^2 - 12x - 6y + 41 = 0,$$

$$x^2 + y^2 + 4x + 6y - 59 = 0.$$

4. Find the co-ordinates of the points on the parabola  $y^2 = 8x$  whose focal distance is 10.
5. If the eccentricity of a hyperbola is  $\frac{5}{4}$ , then find the eccentricity of its conjugate hyperbola

6. Evaluate :  $\int \frac{dx}{1 + e^x}, x \in \mathbb{R}$

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

8. Evaluate :  $\int_0^1 |1-x| dx$ .

9. Evaluate :  $\int \frac{\sin^5 x}{\sin^5 x + \cos^5 x} dx$ .

10. Find the differential equation corresponding to  $xy = ae^x + be^{-x}$ ,  $a$  and  $b$  are parameters.

### SECTION – B

5 × 4 = 20

II. Short answer type questions

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

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

11. Find the equation of tangent and normal at (3, 2) of the circle

$$x^2 + y^2 - x - 3y - 4 = 0$$

12. Find the radical centre of the  $x^2 + y^2 - 2x - 4y - 1 = 0$ ,  $x^2 + y^2 - 6x - 2y = 0$ .

13. Find the equation of the ellipse referred to its major and minor axes as the co-ordinate axes  $x, y$  – respectively with latus rectum of length 4 and distance between foci  $4\sqrt{2}$ .

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. Find the centre, eccentricity foci, directrices and the length of the latus rectum of the hyperbola  $4(y + 3)^2 - 9(x - 2)^2 = 1$ .

16. Evaluate :  $\int_0^4 (16 - x^2)^{\frac{5}{2}} dx$ .

17. Solve :  $\frac{dy}{dx} + y \tan x = \cos^3 x$ .

## 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. Show that the circles  $x^2 + y^2 - 6x - 2y + 1 = 0$ ,  $x^2 + y^2 + 2x - 8y + 13 = 0$  touch each other. Find the point of contact and the equation of common tangent at their point of contact.20. Derive the equation of a parabola in the standard form  $y^2 = 4ax$  with diagram.21. Evaluate :  $\int \sqrt{\frac{5-x}{x-2}} dx$  on (2, 5).22. Obtain reduction formula  $I_n = \int \sin^n x \cdot dx$ ,  $n$  be a positive integer,  $n \geq 2$  and deduce the value of  $\int \sin^4 x \, dx$ 23. Find the area bounded between the curves  $y^2 = 4ax$ ,  $x^2 = 4by$  ( $a > 0$ ,  $b > 0$ ).24. Find the equation of a curve whose gradients is  $\frac{dy}{dx} = \frac{y}{x} - \cos^2 \frac{y}{x}$ , where  $x > 0$ ,  $y > 0$  and which passes through the point  $\left(1, \frac{\pi}{4}\right)$ .

