

Total No. of Questions – 24

Regd.

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 : $\int_0^2 |1-x| dx$.

9. Evaluate : $\int_0^{\pi/2} \frac{\sin^5 x}{\sin^5 x + \cos^5 x} dx$.

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 circles $x^2 + y^2 - 4x - 6y + 5 = 0$,

$$x^2 + y^2 - 2x - 4y - 1 = 0, x^2 + y^2 - 6x - 2y = 0.$$

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 $\left(1, \frac{\pi}{4}\right)$.

