

MATHEMATICS

Paper - II (B)

(English Version)

Time : 3 Hours

Max. Marks

Note: This question paper consists of **three** sections A, B and C.

SECTION - A

(10 × 2)

I. Very short answer type questions:

(i) Answer **all** questions.

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

1. If $x^2 + y^2 - 4x + 6y + c = 0$ represents a circle with radius 6 then find the value of c .
2. Find the chord of contact of $(1, 1)$ to the circle $x^2 + y^2 = 9$.
3. Find K if the pair of circles $x^2 + y^2 + 4x + 8 = 0$, $x^2 + y^2 - 16y + k = 0$ are orthogonal.
4. Show that the line $2x - y + 2 = 0$ is a tangent to the parabola $y^2 = 16x$.
5. If the eccentricity of a hyperbola is $\frac{5}{4}$, then find the eccentricity of its conjugate hyperbola.
6. Evaluate $\int \frac{1}{(x+3)\sqrt{x+2}} dx$, $x \in \mathbb{R} \setminus (-2, \infty)$.
7. Evaluate $\int e^x \frac{(1+x \log x)}{x} dx$ on $(0, \infty)$.



[P.T.O.]

SECTION - B

Differential equation $\left(\frac{d^3y}{dx^3}\right)^2 - 3\left(\frac{dy}{dx}\right)^2 - e^x = 4$.

(5 × 4 = 20)

II. Short answer type questions:

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

11. 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.

12. Find the radical centre of the circles $x^2 + y^2 - 4x - 6y + 5 = 0$, $x^2 + y^2 - 2x - 4y - 1 = 0$, $x^2 + y^2 - 6x - 2y = 0$. *5/6, 7/6*

13. Find the length of latus rectum, eccentricity, coordinates of centre and foci of the ellipse $9x^2 + 16y^2 = 144$.

14. If the normal at one end of a latus rectum of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ passes through one end of the minor axis, then show that $e^4 + e^2 = 1$.
[e is the eccentricity of the ellipse].

5. Find the equations of the tangents to the hyperbola $3x^2 - 4y^2 = 12$ which are
(i) Parallel and
(ii) Perpendicular to the line $y = x - 7$.

Find the area of the region enclosed by the curves $y = e^x$, $y = x$, $x = 0$, $x = 1$.

Solve the differential equation $(e^x + 1) y dy + (y + 1) dx = 0$.

SECTION - C

III. Long answer type questions.

(i) Answer 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 $x^2 + y^2 - 6x - 9y + 13 = 0$, $x^2 + y^2 - 2x - 16y + 13 = 0$.
Find the point of contact and the equation of common tangent at the point of contact.

20. Find the equation of the parabola whose axis is parallel to the x-axis and passes through the points $(-2, 1)$, $(1, 2)$ and $(-1, 3)$.

1. Evaluate $\int \frac{dx}{4 + 5 \sin x}$.

2. If $I_n = \int \sin^n x dx$ for an integer $n \geq 2$, then show that

$$I_n = \frac{-\sin^{n-1} x \cos x}{n} + \frac{(n-1)}{n} I_{n-2}$$

3. Evaluate $\int_0^{\pi} \frac{x}{1 + \sin x} dx$.