



Regd.

No.



MATHEMATICS - PAPER - II (B)

(English Version)

Max. Marks : 75

Note : This question paper consists of three Sections - A, B and C.

SECTION - A

 $10 \times 2 = 20$

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

1. 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 .

2. Find the equation of the circle whose end points of a diameter are $(1, 2)$, $(4, 6)$.

3. Find the equation of the common chord of the circles $x^2 + y^2 - 4x - 4y + 3 = 0$, $x^2 + y^2 - 5x - 6y + 4 = 0$.

4. Find the value of k if the line $2y=5x+k$ is a tangent to the parabola $y^2=6x$.

5. If the eccentricity of a hyperbola is $\frac{5}{4}$, then find the eccentricity of its conjugate hyperbola.

6. Evaluate $\int \frac{1}{7x+3} dx$ on $I \subset \mathbf{R} \setminus \left\{-\frac{3}{7}\right\}$.



7. Evaluate $\int \sqrt{1 - \sin 2x} \, dx$ on $I \subset \left[2n\pi - \frac{3\pi}{4}, 2n\pi + \frac{\pi}{4} \right], n \in \mathbf{Z}$.

8. Evaluate $\int_0^4 |2 - x| \, dx$.



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II

9. Find $\int_0^{\frac{\pi}{2}} \sin^{10} x \, dx$.

10. Find the order and degree of the differential equation $\frac{d^2 y}{dx^2} = \left[1 + \left(\frac{dy}{dx} \right)^2 \right]^{\frac{5}{3}}$.



SECTION - B

II. Short answer type questions :

5x4=20

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

11. Find the length of the chord intercepted by the circle $x^2 + y^2 - 8x - 2y - 8 = 0$ on the line $x + y + 1 = 0$.

12. Find the radical centre of the following 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 length of major axis, minor axis, latus rectum, eccentricity, coordinates of centre, foci and the equations of directrices 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).

15. Find the equations of the tangents to the hyperbola $x^2 - 4y^2 = 4$ which are (i) parallel (ii) perpendicular to the line $x + 2y = 0$.

16. Evaluate $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \frac{\sqrt{\sin x}}{\sqrt{\sin x} + \sqrt{\cos x}} \, dx$.

17. Solve $\frac{dy}{dx} - x \tan(y - x) = 1$.





SECTION - C

III. Long answer type questions :



5x7=35

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

18. 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.

19. If $(2, 0)$, $(0, 1)$, $(4, 5)$ and $(0, c)$ are concyclic then find c .

20. Prove that the area of the triangle inscribed in the parabola $y^2 = 4ax$ is $\frac{1}{8a} |(y_1 - y_2)(y_2 - y_3)(y_3 - y_1)|$ sq. units where y_1, y_2, y_3 are the ordinates of its vertices.



21. Obtain the reduction formula for $\int \sin^n x dx$ for an integer $n \geq 2$ and deduce $\int \sin^4 x dx$.

22. Evaluate $\int \frac{2 \sin x + 3 \cos x + 4}{3 \sin x + 4 \cos x + 5} dx$.

23. Evaluate $\int_0^1 \frac{\log(1+x)}{1+x^2} dx$.

24. Solve $\sqrt{1+x^2} \sqrt{1+y^2} dx + xy dy = 0$.

