

MATHEMETICS ,PAPER – IIB**(English version)****MODEL QUESTION PAPER****(For the Academic year 2021-22 only)****Time : 3 Hours****Max. Marks: 75****Note :** This question paper consist of three section A, B and C.

SECTION – A**I. Very short answer type questions.****i. Answer ANY TEN question.****ii. Each question carriers 2 marks.****10 × 2 = 20**

1. If $ax^2 + bxy + 3y^2 - 5x + 2y - 3 = 0$ represents a circle, find the values of a and b. also find its radius and centre.
2. If the circle $x^2 + y^2 - 4x + 6y + a = 0$ has radius 4 then find a
3. Find the pole of $ax + by + c = 0$ ($c \neq 0$) with respect to $x^2 + y^2 = r^2$
4. Find the equation of the tangent to the circle $x^2 + y^2 - 4x - 6y + 11 = 0$ at the point (3,4)
5. Show the angle between the circles $x^2 + y^2 = a^2, x^2 + y^2 = ax + ay$ is $\frac{3\pi}{4}$
6. Find the equation of the common chord of the circles
 $x^2 + y^2 + 2x + 3y + 1 = 0, x^2 + y^2 + 4x + 3y + 2 = 0$
7. Find the equation of the parabola whose focus is S(1, -7) and vertex is A (1, -2)
8. If the eccentricity of a hyperbola is $\frac{5}{4}$ then find the eccentricity of its conjugate hyperbola
9. Evaluate : $\int \frac{1}{(x+5)\sqrt{x+4}} dx$
10. Evaluate $\int \sec^2 x \cdot \operatorname{cosec}^2 x dx$
11. Evaluate $\int \frac{(a^x - b^x)^2}{a^x b^x} dx$.
12. Evaluate $\int \frac{1}{1 + \sin 2x} dx$
13. Evaluate $\int_0^1 \frac{2x}{x^2+1} dx$

14. Evaluate $\int_0^{\pi/2} \sec^4 \theta d\theta$

15. Find the order and degree of the different equation $\left(\frac{d^2y}{dx^2} - \left(\frac{dy}{dx}\right)^3\right)^{\frac{6}{5}} = 6y$

SECTION - B

II. Short answer type questions,

5 × 2 = 20

i. Answer any FIVE questions.

ii. Each question carries four marks.

16. Show that the tangent at (-1,2) of the circle, $x^2 + y^2 - 4x - 8y + 7 = 0$ touches the circle $x^2 + y^2 + 4x + 6y = 0$, also find its point of contact.
17. Find the angle between the tangent drawn from (3, 2) to the circle $x^2 + y^2 - 6x + 4y - 2 = 0$
18. Find the length of the chord intercepted by the circle $x^2 + y^2 - x + 3y - 22 = 0$ on the line $y = x - 3$
19. Find the equation of the circle passing through the points of intersection of the circle $x^2 + y^2 - 8x - 6y + 21 = 0$, $x^2 + y^2 - 2x - 15 = 0$ and (1, 2)
20. Find the equation of the circle cutting orthogonally to the circle $x^2 + y^2 - 4x - 6y + 11 = 0$, $x^2 + y^2 - 10x - 4y + 21 = 0$ and has $2x + 3y = 7$ as diameter,
21. Find the length of major axis. latus rectum eccentricity of the ellipse $4x^2 + y^2 - 8x + 2y + 1 = 0$
22. If the length of the latus rectum is equal to half of its minor axis of an ellipse in the standard form. Then find the eccentricity of the ellipse.
23. Find the centre, eccentricity, foci, length of latus rectum for the hyperbola $16y^2 - 9x^2 = 144$
24. Evaluate: $\int_0^{\pi/4} \log(1 + \tan x) dx$
25. Evaluate: $\int_0^{\pi/2} \frac{\cos^{\frac{5}{5}} x}{\sin^{\frac{5}{5}} x + \cos^{\frac{5}{5}} x} dx$
26. Solve: $\frac{dy}{dx} + 1 = e^{x+y}$
27. Solve $\tan y dx + \tan x dy = 0$

SECTION –C

III. Long Answer type questions

5 × 2 = 20

- i. **Answer any FIVE questions.**
 - ii. **Each question carries seven marks.**
- IV.** Show that the point (1, 1), (-6, 0), (-2, 2) and (-2, -8) are concyclic.
- V.** Find the direction common tangent to the circles
 $x^2 + y^2 + 22x - 4y - 100 = 0$, $x^2 + y^2 - 22x + 4y + 100 = 0$.
30. Show that the circles $x^2 + y^2 - 4x - 6y - 12 = 0$ and $x^2 + y^2 + 6x + 18y + 26 = 0$, touch each other, also find the point of contact and common tangent at this point if contact.
31. Shown that the common chord of the circles $x^2 + y^2 - 6x - 4y + 9 = 0$ and $x^2 + y^2 - 8x - 6y + 23 = 0$ is a diameter of the second circle and also find its length ,
32. If y_1, y_2, y_3 are the y – coordinates of the vertices of the triangle inscribe in the parabola $y^2 = 4ax$. then show that area of the triangle is $\frac{1}{8a} |(y_1 - y_2)(y_2 - y_3)(y_3 - y_1)|$ square units ,
33. Evaluate : $\int \sin x . \sin 2x . \sin 3x \, dx$
34. Evaluate: $\int \frac{1}{\sin(x-a) \sin(x-b)} \, dx$ an $I \subset \mathbb{R}, \{(a + n\pi: n \in \mathbb{Z}) \cup (b + n\pi: n \in \mathbb{Z})\}$
35. Evaluate: $\int \frac{\sin 2x}{(a+b\cos x)^2} \, dx$
36. Evaluate: $\int_0^{\frac{\pi}{4}} \frac{\sin x + \cos x}{9 + 16 \sin 2x} \, dx = \frac{1}{20} \log 3$.
37. Solve : $\frac{dy}{dx} = \frac{x-2y+1}{2x-4y}$