BOARD OF INTERMEDIATE EDUCATION, A.P.

Mathematics - IIB

Model Question Paper (w.e.f. 2013-14)

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

Time: 3 Hrs  Max. Marks: 75

SECTION – A

I. Very Short Answer type Questions

(i) Answer all Questions

(ii) Each Question carries 2 marks

10 x 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. State the necessary and sufficient condition for \( lx + my + n = 0 \) to be a normal to the circle \( x^2 + y^2 + 2gx + 2fy + c = 0 \).

3. Find the angle between the circles \( x^2 + y^2 - 12x - 6y + 41 = 0 \) and \( x^2 + y^2 + 4x + 6y - 59 = 0 \).

4. Find the equation of the parabola whose focus is \( S(1, -7) \) and vertex is \( A(1, -2) \).

5. Find the angle between the asymptotes of the hyperbola \( \frac{x^2}{a^2} - \frac{y^2}{b^2} = 1 \).

6. Evaluate \( \int \frac{1}{(x+3)\sqrt{x+2}} \, dx \)

7. Evaluate \( \int \frac{\sin^4 x}{\cos^8 x} \, dx \)

8. Evaluate \( \int_0^1 \frac{x^2}{x^2 + 1} \, dx \)

9. Evaluate \( \int_0^\pi \frac{\sin^2 x - \cos^2 x}{\sin x \cos x} \, dx \)

10. Find the order and degree of the differential equation \( \left[ \frac{d^3 y}{dx^3} - \left( \frac{dy}{dx} \right)^{6/5} \right] = 6y \).
II. Short Answer type Questions
   (i) Answer any five Questions
   (ii) Each Question carries 4 marks      \[ 5 \times 4 = 20 \]

11. Show that the tangent at \((-1, 2)\) of 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.

12. Find the equation of the circle passing through the points of intersection of the circles \(x^2 + y^2 - 8x - 6y + 21 = 0\), \(x^2 + y^2 - 2x - 15 = 0\) and \((1, 2)\).

13. Find the length of major axis, minor axis, latus rectum, eccentricity of the ellipse \(9x^2 + 16y^2 = 144\).

14. Show that the point of intersection of the perpendicular tangents to an ellipse \(\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1\), \((a > b)\) lies on a circle.

15. Find the equation of the tangents to the hyperbola \(3x^2 - 4y^2 = 12\) which are
   (i) Parallel to (ii) Perpendicular to the line \(y = x - 7\).

16. Find the reduction formula for \(\int_0^\frac{\pi}{2} \sin^n x \, dx\)

17. Solve: \((1 + y^2) \, dx = (\tan^{-1} y - x) \, dy\)

III. Long Answer type Questions
   (i) Answer any five Questions
   (ii) Each Question carries 7 marks      \[ 5 \times 7 = 35 \]

18. Show that the points \((1, 1), (-6, 0), (-2, 2)\) and \((-2, -8)\), are concyclic.

19. Find the direct common tangents to the circles \(x^2 + y^2 + 22x - 4y - 100 = 0\), \(x^2 + y^2 - 22x + 4y + 100 = 0\).

20. If \(y_1, y_2, y_3\) are the y-coordinates of the vertices of the triangle in the parabola \(y^2 = 4ax\) then show that the area of the triangle is
\[ \frac{1}{8a} \left| (y_1 - y_2)(y_2 - y_3)(y_3 - y_1) \right| \text{ square units.} \]

21. Evaluate \(\int \frac{9\cos x - \sin x}{4\sin x + 5\cos x} \, dx\)

22. Evaluate \(\int \frac{dx}{(1 + x)\sqrt{3 + 2x - x^2}}\)

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

24. Solve: \(\frac{dy}{dx} = \frac{2x + y + 3}{2y + x + 1}\)

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