Total No. of Questions - 24

Total No. of Printed Pages - 4

Regd. No.

MATHEMATICS, Paper - II (B)

(Coordinate Geometry and Calculus)

(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.   Find the equation of the circle whose extremities of a diameter are $(-4, 3)$, $(3, -4)$.

2.   Find the Polar of $(3, -1)$ with respect to $2x^2 + 2y^2 = 11$.

3.   Find the equation of the radical axis of the circles $x^2 + y^2 + 4x + 6y - 7 = 0$, $4\left(x^2 + y^2\right) + 8x + 12y - 9 = 0$.

4.   Find the equation of the parabola whose vertex is $(3, -2)$ and focus is $(3, 1)$.

5. Find the product of lengths of the perpendiculars from any point on the hyperbola $\dfrac{x^2}{16} - \dfrac{y^2}{9} = 1$ to its asymptotes.

6. Evaluate $\displaystyle\int \dfrac{x^8}{1+x^{18}}\,dx$ on R.

7. Evaluate $\displaystyle\int e^x \left(\dfrac{1 + x \, Log \, x}{x} \right) dx$ on $(0, \infty)$

8. Evaluate $\displaystyle\int_0^a \dfrac{dx}{x^2 + a^2}$

9. Find the area bounded between the curves $y = x^2$, $y = x^3$.

10. Solve $\dfrac{dy}{dx} = \dfrac{1 + y^2}{1 + x^2}$.

II. **Short Answer Type Questions.**

i) Attempt **any five** questions.

ii) Each question carries **four** marks.

11. Find the equation of the tangent at the point 30^0 (parametric value of θ) of the circle $x^2 + y^2 + 4x + 6y - 39 = 0$.

12. Find the equation of the circle which passes through the point $(2, 0)$, $(0, 2)$ and orthogonal to the circle $2x^2 + 2y^2 + 5x - 6y + 4 = 0$.

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

14. Find the equation of the tangent 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. Tangents to the hyperbola $\dfrac{x^2}{a^2} - \dfrac{y^2}{b^2} = 1$ makes angles θ_1, θ_2 with transverse axis of a hyperbola. Show that the point of intersection of these tangents lies on the curve $2xy = k\left(x^2 - a^2\right)$ when $Tan\,\theta_1 + Tan\,\theta_2 = k$.

16. Find the area bounded between the curves $y^2 = 4x$, $y^2 = 4\left(4 - x\right)$.

17. Solve $\dfrac{dy}{dx} - y\,Tan\,x = e^x\,Sec\,x$.

III. **Long Answer Type Questions**.

   i)   Attempt **any five** questions.

   ii)   Each question carries **seven marks**.

18. Find the equation of a circle which passes through $(2, -3)$, and $(-4, 5)$ and having the centre on $4x + 3y + 1 = 0$.

19. Find the transverse common tangents of the circles $x^2 + y^2 - 4x - 10y + 28 = 0$ and $x^2 + y^2 + 4x - 6y + 4 = 0$.

20. Show that the equation of common tangents to the circle $x^2 + y^2 = 2a^2$ and the parabola $y^2 = 8ax$ are $y = \pm (x + 2a)$.

21. Evaluate $\int \dfrac{2\,Cos\,x + 3\,Sin\,x}{4\,Cos\,x + 5\,Sin\,x}\,dx$.

22. Obtain the reduction formula for $I_n = \int Cos^n x\,dx$, n being a positive integer $n \geq 2$, and deduce the value of $\int Cos^3 x\,dx$.

23. Evaluate $\displaystyle\int_0^1 \dfrac{Log\,(1 + x)}{1 + x^2}\,dx$.

24. Solve $\dfrac{dy}{dx} = \dfrac{4x + 6y + 5}{3y + 2x + 4}$.