Total No. of Questions - **24**
Total No. of Printed Pages - **3**

Regd. No.

Part - III

MATHEMATICS, Paper - II (B)

(Co-ordinate 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

I. Very short answer type questions. **10 × 2 = 20**

i) Answer **all** questions.

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

1. Obtain the parametric equation of the circle $(x-3)^2+(y-4)^2=8^2$.

2. If (2, 3, 5) is one end of a diameter of the sphere $x^2+y^2+z^2-6x-12y-2z+20=0$, then find the coordinates of the other end of the diameter.

3. Find the points on the parabola $y^2=8x$ whose focal distance is 10.

4. If e, e_1 are the eccentricities of a hyperbola and its conjugate hyperbola, prove that $\frac{1}{e^2}+\frac{1}{e_1^2}=1$.

5. Find the 3rd derivative of $e^x Cos\,x$.

6. Evaluate $\int \frac{Sin^4 x}{Cos^6 x}dx$.

7. Evaluate : $\int \frac{1}{x\,Log\,x\left[Log\left(Log\,x\right)\right]}dx$.

8. Evaluate : $\int_0^1 \frac{x^3}{x^2+1}dx$.

9. Find the area of the region enclosed by the curves $x = 4 - y^2$, $x = 0$.

10. Form the differential equation of the family of all circles with their centers at the origin and also find its order.

SECTION B

II. Short answer type questions. **5 × 4 = 20**

i) Attempt **any five** questions.

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

11. Find the equation of the circle with center (–2, 3) cutting a chord length 2 units on $3x + 4y + 4 = 0$.

12. If the polar of P with respect to the parabola $y^2 = 4ax$ touches the circle $x^2 + y^2 = 4a^2$, then show that P lies on the curve $x^2 - y^2 = 4a^2$.

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

14. Find the area of the triangle formed by the points with polar coordinates $(a,\theta), \left(2a, \theta + \pi/3\right), \left(3a, \theta + 2\pi/3\right)$.

15. Evaluate : $\int \frac{dx}{5 + 4\,Cos\,2x}$.

16. Solve : $x\,dy = \left(y + x\,Cos^2\left(y/x\right)\right)dx$.

17. Solve : $\frac{dy}{dx}\left(x^2y^3 + xy\right) = 1$.

SECTION C

III. Long answer type questions. **5 × 7 = 35**

i) Attempt **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 the common tangent at their point of contact.

19. Find the equation of the circle which passes through the origin and belongs to the coaxial system of which the limiting points are (1, 2) and (4, 3).

20. Find the length of the major axis, minor axis, latus rectum, eccentricity, coordinates of center, foci and the equation of directrices of the ellipse $4x^2+y^2-8x+2y+1=0$.

21. If $y=e^{mSin^{-1}x}$, then prove that

$$\left(1-x^2\right)y_{n+2}-(2n+1)xy_{n+1}-\left(n^2+m^2\right)y_n=0.$$

22. Evaluate : $\int\frac{2Sin\,x+3Cos\,x+4}{3Sin\,x+4Cos\,x+5}dx.$

23. Evaluate : $\int_0^{\pi}\frac{xSin^3x}{1+Cos^2x}dx.$

24. A curve is drawn to pass through the points given by the following table.

x	1	1.5	2	2.5	3	3.5	4
y	2	2.4	2.7	2.8	3	2.6	2.1

Using Simpson's rule, find the approximate area bounded by the curve, the X-axis and the lines $x = 1$ and $x = 4$.