**Part-III**
**MATHEMATICS**
**Paper II (B)**
**(English Version)**

**Time: 3 Hours**                                                                                  **Max. Marks: 75**

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

## SECTION A

I.   Very short answer type questions:
     i) Answer ALL questions
     ii) Each question carries TWO marks.

1.   Find the value 'a' if $2x^2+ay^2-3x+2y-1=0$ represents a circle and also find its radius.

2.   If the length of a tangent from (5, 4) to the circle $x^2+y^2+2ky=0$ is '1', then find 'k'.

3.   Find the equation of the common chord of the circles:
     $(x-a)^2 + (y-b)^2 = c^2$, $(x-b)^2 + (y-a)^2 = c^2$, $(a \neq b)$.

4.   Find the co-ordinates of the points on the parabola:
     $y^2 = 2x$   whose focal distance is 5/2.

5.   Define rectangular hyperbola and find its eccentricity.

6.   Find: $\int \frac{e^x(1+x \log x)}{x} dx$

7.   Find: $\int \frac{\sin (\tan^{-1} x)}{1+x^2} dx, x \in R$

8.   Evaluate: $\int_0^{\frac{\pi}{2}} \sin^5 x \cos^4 x \, dx$

9.   Evaluate: $\int_0^2 |1 - x| \, dx$

10.  Form the differential equation corresponding to
     y= A cos 3x + B sin 3x, where A and B are parameters.

## SECTION B

II.  Short answer type questions:
     i) Attempt ANY FIVE questions.
     ii) Each question carries FOUR marks.

11.  Find the equation of circle whose centre lies on the x-axis and passing through (-2, 3) and (4, 5).

12.  If x+y= 3 is the equation of the chord AB of the circle:
     $x^2+y^2-2x+4y-8=0$, find the equation of the circle having AB as diameter.

13.  Find the equation of tangent and normal to the ellipse
     $9x^2+16y^2= 144$

14.  Find the value of 'k' if:
     4x+y+k=0 is a tangent to the ellipse $x^2+3y^2= 3$.

15.  Find the eqautions of the tangents to the hyperbola:
     $3x^2-4y^2= 12$, which are:
     i) Parallel and
     ii) Perpendicular
     to the line:
     y=x-7.

16.  Find: $\int_0^{\frac{\pi}{2}} \frac{dx}{4+5cosx} dx$

17.  Solve the differential equation:
     $(xy^2+x) dx + (yx^2+y) dy = 0$

## SECTION C

III. Long answer type questions:
   i) Attempt ANY FIVE questions
   ii) Each question carries SEVEN marks.

18. If (2, 0), (0, 1), (4, 5) and (0, C) are concyclics then find 'C'.

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. Evaluate:

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

21. Obtain reduction formula:

$$\int \tan^n x \, dx$$

   for integer n≥2 and evaluate:

$$\int \tan^6 x \, dx$$

22. Derive the standard form of the parabola.

23. Evaluate:

$$\int_0^\pi \frac{x \sin x}{1 + \sin x} dx$$

24. Solve:

$$(1 + y^2)dx = (\tan^{-1} y - x)dy$$