Total No. of Questions—24

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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 $10 \times 2 = 20$

I.   Very short answer type questions :

(i)   Answer ALL questions.

(ii)   Each question carries TWO marks.

1.   Find the value of '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 $\dfrac{5}{2}$.

5. Define rectangular hyperbola and find its eccentricity.

6. Find :

$$\int \frac{e^x (1 + x \log x)}{x} \, dx$$

7. Find :

$$\int \frac{\sin\left(\tan^{-1} x\right)}{1 + x^2} \, dx, \ x \in \mathrm{R}$$

8. Evaluate :

$$\int\limits_0^{\frac{\pi}{2}} \sin^5 x \cos^4 x \, dx$$

9. Evaluate :

$$\int\limits_0^2 |1 - x| \, dx$$

10. Form the differential equation corresponding to

$$y = A \cos 3x + B \sin 3x,$$

where A and B are parameters.

SECTION B   5×4=20

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

$$9x^2 + 16y^2 = 144$$

at the end of the latus rectum in the first quadrant.

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 equations 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 :

$$\int_0^{\frac{\pi}{2}} \frac{dx}{4 + 5\cos x}\,dx.$$

17. Solve the differential equation :

$$(xy^2 + x)\,dx + (yx^2 + y)\,dy = 0.$$

SECTION C 5×7=35

III. Long answer type questions :

(i) Attempt ANY FIVE questions.

(ii) Each question carries SEVEN marks.

18. If

$$(2, 0), (0, 1), (4, 5) \text{ and } (0, C)$$

are concyclics then find 'C'.

19. Find the transverse common tangents of the circles :

$$x^2 + y^2 - 4x - 10y + 28 = 0 \text{ and}$$

$$x^2 + y^2 + 4x - 6y + 4 = 0.$$

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 $n \geq 2$ 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 :

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