Total No. of Questions – 24   Regd.
Total No. of Printed Pages – 4   No.

Part - III
MATHEMATICS, Paper – II(B)
(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 circle with center $C = (-1, 2)$ and radius $r = 5$.

2. Find the equations of the normal at $P = (3, 5)$ of the circle
$S \equiv x^2 + y^2 - 10x - 2y + 6 = 0$.

3. Find the equation of the radical axis of the following circles :
$x^2 + y^2 - 3x - 4y + 5 = 0$, $3(x^2 + y^2) - 7x + 8y - 11 = 0$.

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

[1 of 4]   **P.T.O.**

2023/3/24 15:32

5. If $3x - 4y + k = 0$ is a tangent to $x^2 - 4y^2 = 5$, find the value of k.

6. Evaluate $\int \sqrt{1 - \cos 2x}\, dx$ on $I \subset [2n\pi, (2n + 1)\pi]$, $n \in Z$.

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

8. Evaluate $\int_{2}^{3} \dfrac{2x}{1 + x^2}\, dx$.

9. Find $\int_{0}^{\pi/2} \cos^8 x\, dx$.

10. Find the order and degree of
$$\left[\frac{d^3y}{dx^3}\right]^2 - 3\left[\frac{dy}{dx}\right]^2 - e^x = 4$$

SECTION – B $5 \times 4 = 20$

II. Short Answer Type questions :

(i)   Attempt any **five** questions.

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

11. Find the length of the chord formed by $x^2 + y^2 = a^2$ on the line $x \cos \alpha + y \sin \alpha = P$.

2023/3/24 15:32

12. Find the equation of the circle which cuts orthogonally the circle $x^2 + y^2 - 4x + 2y - 7 = 0$ and having the center at $(2, 3)$.

13. Find the eccentricity, coordinates of foci, length of latus rectum and equations of directrices of the following ellipse :
$$9x^2 + 16y^2 - 36x + 32y - 92 = 0.$$

14. Find the conditions for the line $lx + my + n = 0$ to be a tangent to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$.

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. Evaluate $\displaystyle\int_0^{\pi/2} \frac{\sin^5 x}{\sin^5 x + \cos^5 x}\,dx.$

17. Solve the differential equation
$$\frac{dy}{dx} = \frac{xy + y}{xy + x}$$

SECTION – C

$5 \times 7 = 35$

III. Long Answer Type questions :

   (i) Attempt any **five** questions.

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

18. Find the equation of circle passing through $(3, 4)$, $(3, 2)$, $(1, 4)$.

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

2023/3/24 15:33

20. Derive the equation of the parabola in standard form.

21. Evaluate $\int \dfrac{dx}{5 + 4\cos 2x}$.

22. Evaluate $\int \dfrac{dx}{x(x + 1)(x + 2)}$.

23. Evaluate $\displaystyle\int_{\pi/6}^{\pi/3} \dfrac{\sqrt{\sin x}}{\sqrt{\sin x} + \sqrt{\cos x}}\, dx$.

24. Solve the differential equation
$$(x^2 + y^2)\, dy = 2xy\, dx.$$

———

2023/3/24 15:33