

**2024/FYUG/EVEN/SEM/
MATIDC-151T/130**

FYUG Even Semester Exam., 2024

MATHEMATICS

(2nd Semester)

Course No. : MATIDC-151T

(Geometry)

Full Marks : 70

Pass Marks : 28

Time : 3 hours

*The figures in the margin indicate full marks
for the questions*

SECTION—A

Answer any *twenty* of the following questions :

$1 \times 20 = 20$

1. Find the distance between the points $P(-6, 7)$ and $Q(-1, -5)$.
2. In which quadrant does the point $(-3, 5)$ lie?
3. What is the area of a triangle whose vertices are (x_1, y_1) , (x_2, y_2) and (x_3, y_3) ?

(2)

4. Find the coordinates of the point which divides the line segment joining the points (6, 3) and (-4, 5) in the ratio 3 : 2 internally.
5. Are the points (2, -2), (-3, 8) and (-1, 4) collinear?
6. Does the straight line $2x+3y+5=0$ pass through origin?
7. Find the slope of a line which passes through the points (3, 2) and (-1, 5).
8. Write down the equation of x-axis.
9. What is the slope-intercept form of a line?
10. Find the equation of the line which cuts off an intercept 4 on the positive direction of x-axis and an intercept 3 on the positive direction of y-axis.
11. What is the angle between the pair of straight lines $ax^2+2hxy+by^2=0$ passing through the origin?
12. Write the bisector of angles between pair of straight lines $ax^2+2hxy+by^2=0$.

(3)

13. Does the equation

$$x^2 - 5xy + 4y^2 + x + 2y - 2 = 0$$

represent a pair of straight lines?

14. Under what condition the general equation of second degree

$$ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$$

represents a pair of straight lines?

15. Find the angle between the pair of straight lines $x^2 + 3xy + 2y^2 = 0$.

16. Define circle.

17. Find the equation of a circle whose centre is (2, -3) and radius 5.

18. Find the centre and radius of the circle

$$x^2 + (y+2)^2 = 9$$

19. Find the centre and radius of the circle

$$x^2 + y^2 + 2gx + 2fy + c = 0$$

20. What is the equation of a tangent of slope m to the circle $x^2 + y^2 = a^2$?

21. Define conic section.
22. What is the length of latus rectum of the parabola $y^2 = 16x$?
23. Write the equation of ellipse in standard form.
24. What is the eccentricity of the ellipse

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1, (a > b)?$$

25. For the hyperbola $16x^2 - 9y^2 = 144$, find the length of transverse axes.

SECTION—B

Answer any five of the following questions : $2 \times 5 = 10$

26. Find the value of x , if the distance between the points $(x, -1)$ and $(3, 2)$ is 5.
27. Show that the points $(1, 1)$, $(-2, 7)$ and $(3, -3)$ are collinear.
28. Find the equation of a line with slope -1 and cutting off an intercept of 4 units on negative direction of y -axis.

29. Find the equation of the line joining the points $(-1, 3)$ and $(4, -2)$.

30. Find the value of λ so that the equation

$$6x^2 + xy + \lambda y^2 + 2x - 31y - 20 = 0$$

may represent a pair of straight lines.

31. Find the equation of the bisectors of the angles between the pair of straight lines

$$x^2 - 2pxy - y^2 = 0$$

32. Find the equation of the circle which touches the x -axis and whose centre is $(3, 4)$.

33. Find the centre and radius of the circle given by the equation $x^2 + y^2 + \frac{3}{2}x + 2y + \frac{9}{16} = 0$.

34. Find the coordinates of the foci, the equation of the directrix of the parabola $x^2 = 16y$.

35. Show that $x^2 + 4y^2 + 2x + 16y + 13 = 0$ is the equation of an ellipse.

SECTION—C

Answer any five of the following questions : $8 \times 5 = 40$

36. (a) Show that four points $(0, -1)$, $(6, 7)$, $(-2, 3)$ and $(8, 3)$ are vertices of a rectangle. 4
- (b) Find the area of a triangle whose vertices are $A(3, 2)$, $B(11, 8)$ and $C(8, 12)$. 4
37. (a) In what ratio does the point $(-1, -1)$ divide the line segment joining the points $(4, 4)$ and $(7, 7)$? 4
- (b) Find the area of the quadrilateral $ABCD$ whose vertices are respectively $A(1, 1)$, $B(7, -3)$, $C(12, 2)$ and $D(7, 21)$. 4
38. (a) Find the area of the triangle formed by the lines $y = x$, $y = 2x$ and $y = 3x + 4$. 4
- (b) Find the point of intersection of the pair of lines $2x - y + 3 = 0$ and $x + y - 5 = 0$. 4
39. (a) Find the equation of the line which is parallel to $3x - 2y + 5 = 0$ and passes through the point $(5, -6)$. 4
- (b) Find the angles between the straight lines $x - y\sqrt{3} - 5 = 0$, $\sqrt{3}x + y - 7 = 0$. 4

40. (a) Show that $5x^2 - 6xy + y^2 = 0$ represents a pair of straight lines. Also find the straight lines. 4
- (b) Prove that $6x^2 - 5xy - 6y^2 + 14x + 5y + 4 = 0$ represents a pair of perpendicular straight lines. 4
41. (a) Show that $12x^2 - 10xy + 2y^2 + 14x - 5y + 2 = 0$ represents a pair of straight lines. Also find the angle between the straight lines. 4
- (b) Prove that $x^2 + 6xy + 9y^2 + 4x + 12y + 5 = 0$ represents a pair of parallel straight lines and find the distance between them. 4
42. (a) Find the equation of the circle whose centre is $(1, 2)$ and which passes through the point $(4, 6)$. 4
- (b) Find the equation of the circle that passes through the points $(1, 0)$, $(-1, 0)$ and $(0, 1)$. 4

43. (a) Find the equation of the circle, the coordinates of the end points of whose diameter are $(-1, 2)$ and $(4, -3)$. 4
- (b) Find the equation of the tangents to $x^2 + y^2 = 3$ which make an angle of 60° with x -axis. 4
44. (a) Find the equation of the parabola whose focus is $(0, 0)$ and whose directrix is the straight line $3x - 4y + 2 = 0$. 4
- (b) Derive the standard equation of parabola $y^2 = 4ax$. 4
45. (a) Find the lengths of major and minor axes, coordinates of foci and vertices and eccentricity for the ellipse
 $16x^2 + 25y^2 = 400$ 4
- (b) Show that the equation
 $9x^2 - 16y^2 - 18x + 32y - 151 = 0$
represents a hyperbola. Also find the latus rectum of the hyperbola. 3+1=4

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