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 : 1×20=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)?

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 $ax^2+2hxy+by^2=0$.

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 : 2×5=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 : 8×5=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 those 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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