Total No. of Questions : 09

Bachelor of Science - Honours (Mathematics) (Sem.–1)
CO-ORDINATE GEOMETRY
Subject Code : UC-BSHM-102-19
M.Code : 77313
Date of Examination : 17-01-23

Time : 3 Hrs.   Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :
1.   **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2.   **SECTION - B & C have FOUR questions each.**
3.   **Attempt any FIVE questions from SECTION B & C carrying EIGHT marks each.**
4.   **Select atleast TWO questions from SECTION - B & C.**

SECTION-A

1.   **Solve the following :**

a)   Form the equation which represents the following pair of lines $3x-y = 0$ and $x+3y = 0$.

b)   Find the equation of bisectors of the angles between the lines $6x^2 - 12xy + 5y^2 = 3$.

c)   Find the angle between the following pair of equations $x^2 - 4y^2 = 0$.

d)   Find the equation of the circle whose radius is 4 and center is $(1, 2)$.

e)   Find the coordinates of the center and radius of the circle whose equation is $x^2 + y^2 - 4x - 16 = 0$.

f)   Write the equation of a circle described on the line joining the points $A\{x_1, y_1)$ and $B(x_2, y_2)$ as a diameter.

g)   Find the equation of the tangent to the circle $x^2 + y^2 = 13$ at the point $(2, 3)$.

h)   Define parabola and also give an example.

i)   Define rectangular hyperbola.

j)   Simplify the following equation by changing to a new origin

$x^2 + y^2 + 2x - 4y + 1 = 0$; new origin $(-1, 2)$.

SECTION-B

2. a) Show that the following equations represent a pair of lines (a) $x^2 - 4y^2 = 0$. (b) $x^2 - 2xy \cot 2\alpha - y^2 = 0$.

   b) Find the value of k for which the two lines $6x^2 - 8xy + ky^2 = 0$ are perpendicular to one another.

3. Prove that the lines joining the origin to the points common to:

   $3x^2 + 5xy - 3y^2 + 2x + 3y = 0$ and $3x - 2y = 1$ are at right angles.

4. a) Find the equation of the circle with given center and radius.

   b) Find the equation of the circle which passes through the points

   $(0, 0), (5, -7), (1, -3)$.

5. a) Prove that the circles $x^2 + y^2 - 8x - 2y + 16 = 0$ and $3x^2 + 3y^2 - 14x + 23y - 15 = 0$ cut orthogonally.

   b) Find the radical axis of the following pair of circles:

   $x^2 + y^2 + 2x + 3y + 1 = 0$

   $x^2 + y^2 + 4x + 3y + 2 = 0$.

SECTION-C

6. a) Find the equation of the parabola whose focus is (5,2) and directrix is $x - 1 = 0$.

   b) Prove that the line $lx + my + n = 0$ touches the parabola $y^2 = 4ax$ if $ln = am^2$.

7. a) Find the equation of the ellipse referred to its axes as coordinate axes whose eccentricity is $\dfrac{1}{4}$ and foci are $(\pm\sqrt{2}, 0)$.

   b) Find the equation of the hyperbola whose axes are as coordinate axes and which also satisfies the conditions given below :

   Focus (6, 0) and vertex (4, 0).

8. Transform the equation $5x^2 - 2xy + 5y^2 + 2x - 10y - 7 = 0$ of the rectangular axes through the point (0,1) inclined at an angle 45° with the old axes.

9. Identify the curve represented by the equation $3x^2 + 2xy + 3y^2 + 18x + 22y + 50 = 0$. Reduce it to standard form by suitable transformation of axes.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.