This question paper contains 3 printed pages.

5/12/16 (Eve) Mondayour Roll No. GC-3

Sl. No. of Ques. Paper: 2320GC-3Unique Paper Code: 62354343Name of Paper: Analytical Geometry and Applied AlgebraName of Course: B.A. (Prog.) Mathematics (CBCS)Semester: IIIDuration :: 3 hoursMaximum Marks: 75

(Write your Roll No. on the top immediately on receipt of this question paper.)

All questions are compulsory. Attempt any two parts from each question.

SET-C

1. (a) Identify and sketch the curve: $x = y^2 - 4y + 2$

and also label the focus, vertex and directrix.

(b) Describe the graph of the curve:

$$3(x+2)^2 + 4(y+1)^2 = 12$$

Also find its centre and foci.

(c) Describe the graph of the hyperbola: $x^{2} - y^{2} - 4x + 8y - 21 = 0$

And sketch its graph.

(a) Find the equation of the parabola that has its vertex at (1,2) and focus at (4,2). Also state the reflection property of parabola.

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- (b) Find the equation of the ellipse whose length of major axis is 26 and foci (±5,0) and also sketch it.
- (c) Find and sketch the curve of the hyperbola whose foci are (6,4) and (-4,4) and eccentricity is 2.
- 3. (a) Consider the equation:

 $3x^2 + 2xy + 3y^2 = 19$.

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Rotate the coordinate axes to remove the xy-term. Then identify the type of conic represented by the equation and sketch its graph.

(b) Let an x'y' - coordinate system be obtained by rotating an xy - coordinate system through an angle $\theta = 30^{\circ}$.

- (i) Find the x'y' coordinate of the point whose xy coordinates are (2, 4).
- (ii) Find an equation of the curve $2x^2 + 2\sqrt{3}xy = 3$ in x'y' coordinates.
- (c) Find the equation of two spheres that are centered at the origin and are tangent to the sphere of radius 1 centered at (0,0,7).
- 4(a) (i) Find a vector of length 9 and oppositely directed to v = -5i + 4i + 8k.

(ii) Sketch the surface 2x + z = 3 in 3-space.

- (b) (i) Find the vector component of $\mathbf{v} = 2\mathbf{i} \mathbf{j} + \mathbf{k}$ orthogonal to $\mathbf{b} = \mathbf{i} + 2\mathbf{j} + 28\mathbf{k}$.
 - (ii) Find the area of triangle with vertices P(2, 0, -3), Q(1,4, 5), R(7, 2, 9). $3+3\frac{1}{2}$
- (c) Prove that

$$\|\mathbf{u} + \mathbf{v}\|^{2} + \|\mathbf{u} - \mathbf{v}\|^{2} = 2\|\mathbf{u}\|^{2} + 2\|\mathbf{v}\|^{2}$$

and interpret the result geometrically.

5 (a) Let L_1 and L_2 be the lines whose parametric equations are

- L₁ : x = 4t y = 1-2t z = 2 + 2tL₂ : x = 1 + t y = 1 - t z = -1 + 4t
- (i) Show that the lines L_1 and L_2 intersect at the point (2, 0, 3).
- (ii) Find the parametric equation of line that is perpendicular to L_1 and L_2 and passes through their point of intersection. $3+3\frac{1}{2}$
- (b) (i) Determine whether the points $P_1(6, 9, 7)$, $P_2(9, 2, 0)$ and $P_3(0, -5, -3)$ lie on the same line.
 - (ii) Where does the line

x = 2 - t, y = 3t, z = -1 + 2t

intersect the plane 2y + 3z = 6.

(c) (i) Find the equation of the plane through (1, 4, 3) that is perpendicular to the line

x = 2 + t, y + 3 = 2t, z = -t.

 $3+3\frac{1}{2}$

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 $6\frac{1}{2}$

 $3+3\frac{1}{2}$

(ii) Determine whether the planes

3x - 2y + z = 1, 4x + y - 2z = 4

are parallel, perpendicular or neither.

- 6. (a) Given three containers 3, 7, and 10 liters respectively with the largest being full of water, determine a minimum sequence of pouring method of dividing this quantity of water into two equal amounts of 5 liters using the three containers and no other measuring devices. $6\frac{1}{2}$
- (b) Is the following square a Latin square? Can it be a group with the multiplication operation defined?

*	1	2	3	4	5
1	1	2	3	4	5
2	2	1	4	5	3
3	3	4	5	2	1
4	4	5	1	3	2
5	5	3	2	1	4

(c) (i) Given the influence model. Find the sets of minimum number of vertices which can influence every other vertex in the graph.



(ii) Find a matching or explain why none exists for the following graph.



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 $6\frac{1}{2}$

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