**Code No: C8904** 

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD M.TECH I SEMESTER EXAMINATIONS, APRIL/MAY-2012 GEOMETRIC MODELING (ENGINEERING DESIGN)

Time: 3hours Max.Marks:60

## Answer any five questions All questions carry equal marks

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- 1.a) Write down the parametric form of circle and explain with the efficient algorithm to generate it
  - b) Generate an ellipse with semi major axis of 6 units and semi minor axis of 2 units inclined at an angle of 45<sup>0</sup> to the horizontal with center at (3,4) by using efficient algorithm and represent quarter part of ellipse graphically.
- 2.a) A Cubic Bezier curve is defined by the control points as P0(1,1), P1(2,3), P2(4,3),P3(5,1). Find the equation of curve and its mid point.
  - b) What is the need of curve manipulation? Explain various curve manipulation techniques.
- 3. What are the characteristics of B Spline curve and its advantages and disadvantages? Derive the parametric form equation for B spline curve.
- 4.a) The homogeneous coordinate system is the most preferred way to be used in geometric modeling. Why?
  - b) Prove the following:
    - i. Scaling and mirroring about Z axis is commutative
    - ii. Two successive translations are commutative.
  - c) A rectangle with coordinate A (2,3), B (2,5), C(6,5) and D (6,3) is reflected along line whose equation is y=2x+4, and sheared by 2 units in the x direction and 3 units in y direction. Find the new coordinates of the object.
- 5. Derive the parametric form of following
  - a) Bezier surface
- b) B-Spline surface
- c) Coon's surface
- 6.a) What are surface manipulation techniques used in surface modeling?
  - b) A circle with radius of 5 units having center located at point (20,10,0) is rotated about the x axis by an angle  $2\pi$  to obtain a surface revolution. Calculate the surface point at  $\theta = \pi$  and  $\Phi = \pi$ .
- 7. Explain the following:
  - a) Spatial occupancy enumeration
  - b) Octree Encoding
  - c) Constructive modeling
  - c) Boundary representation
- 8. Write a short notes on any **THREE** of the following:
  - a. Hermite cubic curve
  - b. Tabulated cylinder
  - c. Reflection transformation
  - d. Gaussain curvature