

**I M.Tech - II Semester – Regular/Supplementary Examinations –
JULY - 2017**

**GEOMETRIC MODELING
(MACHINE DESIGN)**

Duration: 3 hours

Max. Marks:70

Answer any FIVE questions. All questions carry equal marks

1. a) If $P(x, y, z)$ is an object reference point for scaling, explain how the scaling operation is defined in terms of scaling with respect to the origin. 7 M

- b) A pyramid defined by the coordinates $A(0,0,0)$, $B(1,0,0)$, $C(0,1,0)$ is rotated by 45° about the line L that has the direction $V=J+K$ and passing through point $C(0,1,0)$. Find the coordinates of rotated figure. 7 M

2. Determine the piecewise cubic spline curve for the four two-dimensional position vectors $(0,0)$, $(1,1)$, $(2,-1)$ and $(3,0)$ using chord approximation method with the tangent vectors at the ends $(1,1)$ and $(1,1)$. Also calculate intermediate points at $1/3$ and $2/3$ for each segment. 14 M

3. a) Explain the role of control points in Bezier's approach, also explain about degree elevation. 7 M

- b) (1,1), (2,3), (4,3) and (3,1) are the vertices of a Bezier polygon. Determine the seven points on the Bezier curve and plot the curve. 7 M
4. a) Consider a quadratic B-spline curve with uniform knot spacing. Consider a segment with control points (1, 0) (1,1) and (0, 1) in that order. What are the end-points of the curve segment? What is the mid-point of the curve segment? 7 M
- b) Explain about the characteristics of B-Spline curves. 7 M
5. a) Explain surfaces of revolution with examples. 5 M
- b) Consider a parabolically blended curve with the following points [0 1 0], [2 3 0],[4 1 0] and [5 2 0]. Rotate this curve about the x-axis through 2π and also calculate surface points at 0.5 and $\theta=\pi/3$. 9 M
6. Explain the parametric representation of the following synthetic surfaces :
- a) B- Spline surface. 7 M
- b) Coon`s surface. 7 M
7. a) Explain the concept of half spaces in solid modeling. 7 M
- b) Compare 2D and 3D wire frame models. 7 M

8. Explain the algebraic and geometric forms of a Tri-cubic solid.

14 M