Reg. No.



I SEMESTER M.TECH (COMPUTER AIDED ANALYSIS AND DESIGN) END SEMESTER MAKE-UP EXAMINATION DEC 2016/JAN.2017 SUBJECT: GEOMETRIC MODELLING FOR CAD (MME 5103) REVISED CREDIT SYSTEM (31/12/2016)

Time: 3 Hour

Max. Marks: 50

- Note: (i) Missing data, if any, may be appropriately assumed
 - (ii) Draw the sketch as applicable
 - (iii) Assumptions made must be clearly mentioned
- 1A. Explain with the help of a schematic the working of a typical color raster display. 05
- 1B. What is Z-buffer algorithm? Explain the steps of the algorithm. 05
- 2A. Deduce the Bezier basis functions for defining a Bezier curve of order 4. Write the 05 final parametric equation for the curve and express it in matrix form. Also schematically represent the curve along with its characteristic polygon.
- 2B. The parametric equations of a parabola are given as $x(u) = 3u^2$ and y(u) = 6u. The 05 curve has its vertex at (4, 2). Using the recursive parametric equations, compute the coordinates of eight points on the curve in the range $-4 \le y \le 7$.

3A. Explain the following curves and write their parametric equations.

- (i) COONS surface patch
- (ii) Bilinear surface patch
- 3B. A tabulated surface is obtained by sweeping a Bezier curve defined by the control 05 points (4, 6, 10), (6, 5, 8), (10, 3, 7) and (12, 2, 11). The sweeping direction is defined by a vector with end points (4, 6, 10) and (8, 10, 14).
 - (i) Set up the parametric equation for the surface, assuming *u* to be parameter for the Bezier curve and *v* as that for the sweeping direction.
 - (ii) Evaluate the coordinates on the surface at (u = 0.6, v = 0.3) and (u = 0.3, v = 0.6)

05

- 4A. Explain the solid modelling techniques:
 (i) Constructive Solid Geometry
 (ii) Boundary Representation
 Also list their merits and de-merits
- 4B. Determine the coordinates of the pixels to be lit on a raster display terminal for 05 displaying a straight line with end points (2, 3) and (-10, -7). Use Bresenham's line algorithm.
- 5A. A projection plane is defined by its unit normal vector $l\hat{i} + m\hat{j} + n\hat{k}$ and passes 05 through a point (x_r, y_r, z_r) . Deduce the homogeneous transformation matrix for obtaining the orthographic projection of a line segment on the projection plane. The line segment has end points (x_1, y_1, z_1) and (x_2, y_2, z_2) .
- 5B. A line on the x-y plane has end points (-5, 3) and (2, -4). It is required to rotate the 05 line about the point (-5, 3). List the sequence of transformations required to obtain the rotation. Determine the coordinates of the rotated line.

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