Code: ME-370

## Subject: Computer Aided Design (Open Elective) Date of Examination:28-11-2023

# B. Tech End Semester Examination (November 2023) <br> Department of Mechanical Engineering 

Max Marks: 50

Time: 3Hrs
Session: 14:30-17:30

1. (a) An eight plane raster display has a resolution of $1280 \times 1024$ with a refresh rate of 60 Hz non interlaced. Find the (i) RAM size of refresh buffer (ii) Time required to display a scan line and a pixel (iii) active display area of the screen if the resolution is 78 pixels.
(b) Explain in detail the surface of revolution and present diagrammatically the parametric representation of the surface of revolution.
2. A cube with one corner cut has CVs as: $\left(\begin{array}{lll}0 & 0 & 1\end{array}\right),\left(\begin{array}{lll}1 & 0 & 1\end{array}\right),\left(\begin{array}{lll}1 & 0.5 & 1\end{array}\right),\left(\begin{array}{lll}0.5 & 1 & 1\end{array}\right),\left(\begin{array}{ll}0 & 1\end{array}\right),\left(\begin{array}{ll}0 & 0\end{array}\right.$ $0),\left(\begin{array}{lll}1 & 0 & 0\end{array}\right),\left(\begin{array}{lll}1 & 1 & 0\end{array}\right),\left(\begin{array}{lll}0 & 1 & 0\end{array}\right),\left(\begin{array}{lll}1 & 1 & 0.5\end{array}\right)$. Perform transformation sit $\varphi=30^{\circ}$ rotation about y axis and $\theta=45^{\circ}$ is rotation about X axis. Find the resultant coordinates of the cube.
3. (a) What are the merits and demerits of wire frame modeling?
(b) The coordinates of four control points relative to a current WCS are given as: $P_{0}=\left[\begin{array}{lll}2 & 2 & 0\end{array}\right]^{\mathrm{T}}, \mathrm{P}_{1}=\left[\begin{array}{lll}2 & 3 & 0\end{array}\right]^{\mathrm{T}}, \mathrm{P}_{2}=\left[\begin{array}{lll}3 & 3 & 0\end{array}\right]^{\mathrm{T}}, \mathrm{P}_{3}=\left[\begin{array}{lll}3 & 2 & 0\end{array}\right]^{\mathrm{T}}$, Find the equation of the resulting Bezier curve, Also find points on the curve for $\mathrm{u}=0, \mathrm{u}=1 / 4, \mathrm{u}=1 / 2, \mathrm{u}=3 / 4, \mathrm{u}=1$.
4. (a) Given a parametric curve whose geometric coefficient are $B=\left[P_{0}, P_{1}, P_{0}{ }^{\prime}, P_{1}{ }^{\prime}\right]^{T}$. Truncate the curve at $u=0.2$ and $u=0.7$ and represent such that $u \in[0,1]$, Find the relation between the geometric coefficient of truncated curve and original curve
(b) A cubic spline curve is define by the equation: $\mathrm{P}(u)=\mathrm{C}_{3} \mathrm{u}^{3}+\mathrm{C}_{2} \mathrm{u}^{2}+\mathrm{C}_{1} u+\mathrm{C}_{0}, \quad 0 \leq u \geq 1$ where $C_{3}, C_{2}, C_{1}$ and $C_{0}$ are the polynomial coefficients. Assume that these coefficients are known, find the four control points that define an identical Bezier curve.
5. Write short notes on:
(a) Design Optimization
(b) Gradient Based and Heuristic Methods
(c) Optima and its characteristics
