



### End Term Examinations (December 2018)

School: Engineering

Program: M.Tech Biomedical Engineering

Course: Computer Aided Product Design

Course Code: BEN505

Semester: I

Max Marks: 40

Duration (mins): 120

1. Write a note on Bezier curve. Mention any five properties and shortcomings faced in the use of this type of curve.

OR

(08)

The corners of a wedge shaped block are  $(0\ 0\ 2; 0\ 0\ 3; 0\ 2\ 3; 0\ 2\ 2; -1\ 2\ 2; -1\ 2\ 3)$ . A plane passes through  $(0\ 0\ 1)$  and its equation is given by  $3x + 4y + z - 1 = 0$ . Find the reflection of the wedge through this plane.

2. Show that the reflection about an arbitrary line  $ax + by + c = 0$  is given by:

$$\begin{bmatrix} b^2 - a^2 & -2ab & 0 \\ -2ab & a^2 - b^2 & 0 \\ -2ac & -2bc & \frac{1}{a^2 + b^2} \end{bmatrix}$$

use combination of translate-rotate-reflect transformations.

OR

(08)

A cubic spline curve is defined by the equation

$$P(u) = C_3u^3 + C_2u^2 + C_1u + C_0, \quad 0 \leq u \leq 1$$

where  $C_3$ ,  $C_2$ ,  $C_1$ , and  $C_0$  are the polynomial coefficients. Assuming these coefficients are known, find the four control points that define an identical Bezier curve.

3. Write notes on any 5 of the following: (20)

- a. Boundary Representation (B-rep) of solids
- b. Constructive Solid Geometry (CSG) representation of solids
- c. Stages of New Product Development process
- d. Quality Function Deployment – House of Quality
- e. P-diagram, FMEA and their linkage
- f. Design for Reliability and Design for Manufacturability

4. Explain Design of Experiments and describe any one type of DoE. (04)