## C.U.SHAH UNIVERSITY

 Summer Examination-2016
## Subject Name : Computer Aided Design and Engineering

Subject Code : 4TE06CDE1
Semester : 6 Date : 06/05/2016

## Branch :B.Tech (Mechanical)

Time :02:30 To 05:30 Marks :70
Instructions:
(1) Use of Programmable calculator \& any other electronic instrument is prohibited.
(2) Instructions written on main answer book are strictly to be obeyed.
(3) Draw neat diagrams and figures (if necessary) at right places.
(4) Assume suitable data if needed.

## Q-1

## Attempt the following questions:

a) Computer Aided Design is an activity to
(a) prepare drawing on computer
(b) perform analysis on computer
(c) perform animations of object
(d) All of the above
b) The quality of an image depends on
a) No. of pixel used by image
b) No. of line used by image
c) No. of resolution used by image
d) None
c) Full form of DDA is
a) Direct Design Analysis
b) Digital Deferential Analyser
c) Digital Design Algorithm
d) Direct Deferential Analysis
d) $(2,4)$ is a point on a circle that has center at the origin. Which of the following points are also on circle?
a) $(2,-4)$
b) $(-2,4)$
c) $(-4,-2)$
d) All of above
e) The transformation in which an object is moved from one position to another in circular path around a specified pivot point is called
a) Rotation
b) Shearing
c) Translation
d) Scaling
f) If a point ( $\mathrm{x}, \mathrm{y}$ ) is reflected about an axis which is normal to the XY plane and passing through the origin, the reflected point $(x, y)$ is,
a) $(x,-y)$
b) $(-x, y)$
c) $(-x,-y)$
d) $(y, x)$
g) The Bezier curve obtained from the four control points is called a
a) Quadratic Bezier curve
b) Cubic Bezier curve
c) Hectare Bezier curve
d) Rectangle Bezier curve

h) Surface represents the path of moving line or a curve, called a
a) generatrix
b) directrix
c) matrix
d) apex
i) .............. is the FEA software
a) ANSYS
b) NASTRAN
c) COSMAS
d) all of these
j) A finite element has a specific structural shape \& is interconnected with the adjacent elements is given by $\qquad$
a) Nodes
b) element in truss
c) bar element
d) none of these
k) In Finite Element Analysis meaning of meshing is,
a) development of elements
b) application of load
c) applying boundary conditions
d) all of the above
l) The value of shape function at its own node is $\qquad$
a) zero
b) one
c) two
d) variable
m) The coordinate system is the frame of reference for the entire continuum of structure is.....
a) local coordinate
b) global coordinate
c) natural coordinate
d) none of these
n) Finite element analysis for lathe bed can be carried though $\qquad$
a) structural analysis
b) thermal analysis
c) fluid analysis
d) none of these

## Attempt any four questions from Q-2 to Q-8

## Q-4

## Attempt all questions

a) What do you mean by scan conversion? Explain Bresenham's circle drawing 07 algorithm.
b) Using Bresenham's line algorithm, find the pixel positions along the line path between end points $(20,10)$ and $(30,18)$.

## Attempt all questions

a) Prove with example that a uniform scaling $\left(S_{X}=S_{Y}\right)$ and a rotation form a commutative pair of operations but that in general scaling and rotation are not commutative operations.
b) A triangle ABC with co-ordinates $(2,2)(4,4)$ and $(3,5)$ is reflected first about the X axis and then about the line $\mathrm{Y}=-\mathrm{X}$. Prove that the result is same as that obtained when the triangle is rotated about the origin by angle of $270^{\circ}$.

## Attempt all questions

a) The end points of a cubic spline curve are $\mathrm{P}_{0}(1,2)$ and $\mathrm{P}_{1}(7,1)$. The tangent vector for07 end $P_{0}$ is given by line joining $P_{0}$ and point $P_{2}(-2,1)$. The Tangent vector for end $P_{1}$ is given by line joining $P_{3}(9,-2)$ and point $P_{1}$.

1. Determine the parametric equation of hermite cubic curve.

2. Determine the parametric equation for tangent Vector.
3. Determine five points on curve
b) Write the demerits of Cubic spline and explain the difference between Cubic spline and Bezier curve.

## Q-5

a) What is FEA? Explain steps involved in FEA.
b) Figure 1 shows a truss consisting of three elements whose EA/L value is $1000 \mathrm{~N} / \mathrm{mm}$ using FEM determine the deflection at node 2 and reaction force at support.


Figure 1

## Q-6 Attempt all questions

a) A steel tapered bar of 1200 mm length has the cross - sectional areas of $450 \mathrm{~mm}^{2}$ and $150 \mathrm{~mm}^{2}$ at two ends. It is fixed at large and subjected to tensile load of 35 kN at free end. The modulus of elasticity for the bar material is $2 \times 10^{5} \mathrm{~N} / \mathrm{mm}^{2}$. Model the bar with three finite element each having length of 400 mm and calculate the stresses in each element.
b) A manufacturing firm produces two machine parts using lathes, milling machine and grinding machines. The different machining times required for each part. The machining times available on different machines and the profit on each machine part are given in Table

| Type of Machine | Machining time Required for Machine <br> part (Minutes) |  | Maximum Time <br> Available Per week <br> (Minutes) |
| :--- | :---: | :---: | :---: |
|  | I | II | 2500 |
| Lathes | 10 | 5 | 2000 |
| Milling machines | 4 | 10 | 450 |
| Grinding machines | 1 | 1.5 |  |
| Profit per unit | Rs. 50 | Rs. 100 |  |

Determine the number of parts I and II to be manufactured per week to maximize the profit.


## Attempt all questions

a) What is design optimization? Explain its application and advantages in engineering design
b) Explain the following with reference to optimization:
i) Objective function
ii) Constraints
iii) Linear Programming Problem (LPP)
iv) Non-linear Programming Problem (NLPP)

Q-8 Attempt all questions
a) Write a note on wire frame model. 04
b) Write a note on Constructive Solid Geometry (CSG).05
c) Write the step by step design procedure in conventional and CAD environment. 05


