## B.E. Mechanical Engineering Eighth Semester <br> ME805-Computer Aided Design

P. Pages : 3

GUG/W/18/2080
Time : Three Hours

Notes : 1. All questions carry marks as indicated.
2. Answer 1 or 2,3 or 4,5 or 6,7 or 8 , and 9 or 10 .
3. Use of non programmable calculators is permitted.

1. a) Define CAD: What are the advantages of CAD over conventional Design Cycle? Explain.
b) What is frame buffer. Explain.
c) What are desirable features of line drawing algorithms.

## OR

2. a) Derive an expression for decision parameter $\delta_{1}$, in case of Bresenham's mid point ellipse generation algorithm in region I where $\frac{d y}{d x}<-1$.
b) Simulate choice of pixel by DDA for drawing a line between $(2,3)$ and $(8,6)$.
3. a) A triangle having vertices at $\mathrm{A}(2,1), \mathrm{B}(4,2)$ and $\mathrm{C}(3,6)$ is to be reflected about its bare AB . What are the sequence of steps to be performed. Find final position of triangle, after finding the transformation matrix.
b) Write transformation matrix for 2D transformations for
(1) X-Shear, (2) Y-Shear (3) Reflection about X (4) Reflection about Y

## OR

4. a) A cube of 6 mm side having one corner at the origin is enlarged twice in all directions and then translated 3 mm in x -direction and 2 mm in y -direction. Find the final transformation matrix for these operations.
b) Write parametric form of Bezier curve $\mathrm{B}(\mathrm{u})$ with control points at
$\mathrm{B}_{0}(-1,5), \mathrm{B}_{1}(2,0), \mathrm{B}_{2}(4,6)$ and $\mathrm{B}_{3}(6,8)$. Evaluate this function at $B(0.75), B(0.25)$ and $B(0.8)$.
5. a) Discuss properties of stiffness matrix.
b) The lower ends of the three bars shown in fig Q5B are at the same level before the rigid homogeneous 18 Mg block is attached Each steel bar has an area of $600 \mathrm{~mm}^{2}, \mathrm{E}=200 \mathrm{GPa}$ and length of 1.0 m . For bronze bar, the area is $900 \mathrm{~mm}^{2}, \mathrm{E}=83 \mathrm{GPa}$ and length is 1.6 m . Find the stress developed in each bar.


## OR

6. Consider the two bars shown in Fig. Q. 6. If the deformation of the right and is not to exceed 3 mm , find nodal displacement, element stresses and support reactions.
Take E=200GPa.

7. For the truss shown in Fig. Q. 7, Determine the displacement at nodes end stresses in each member. Take $\mathrm{E}=200 \mathrm{GPa} \& \mathrm{~A}=200 \mathrm{~mm}^{2}$ for each member.


OR
8. a) The nodal co-ordinates of a triangular elements are shown in Fig. Q. 8A. At the interior point ' P ' the x -Coordinate is 4 and $\mathrm{N}_{1}=0.3$.
Determine $\mathrm{N}_{2}, \mathrm{~N}_{3}$ and Y .
coordinate of P .

b) For a triangular element with vertices at $1(1,1), 2(8,4)$ and $3(2,7)$ Obtain the strain displacement matrix and hence determine strains $\in_{\mathrm{x}}, \in_{\mathrm{y}}$ and $\gamma_{\mathrm{xy}}$.

9. a) Discuss "Simplex search Method for multivariable optimization and also write an algorithm for same.
b) Define the following terms with reference to optimal Design problem formulation.
i) Design variables
ii) Constraints
iii) Objective function
iv) Variable Bounds

## OR

10. Write short notes on any four.
a) Bisection Method
b) Golden Search Method
c) Shape functions for LBE
d) Rasterization
e) Types of FE elements
f) Synthetic Curves
