

Computer Aided Design & Finite Element Analysis

Q.P. Code : 608102

(3 Hours)



[Total Marks : 80]

- NB: 1) Question No.1 is compulsory.  
2) Answer any three questions out of the remaining five questions.  
3) Assume suitable data if necessary and state them clearly.  
4) Figures to the right indicate Full Marks.

1. Write Short notes on the following :-

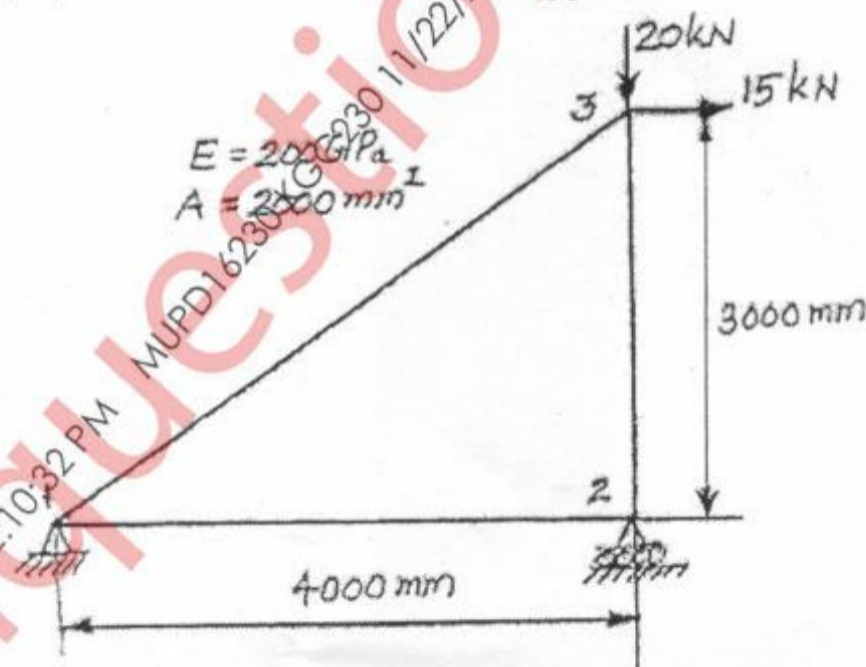
- (a) 3D Transformations.  
(b) General procedure of finite element method.  
(c) Comparison of wire frame modelling with solid modelling.  
(d) Applications of finite element method.

2. (a) Consider a line from (0, 0) to (6, 7). Use Bresenham's algorithm to rasterize the line. 10

(b) Explain with an example DDA line drawing algorithm. 10

3. (a) A three bar truss made of steel ( $E = 200 \text{ GPa}$ ) is subjected to the horizontal force of 15 kN and vertical force of 20 kN as shown in the figure below. The cross-sectional area of each element is  $2000 \text{ mm}^2$ . Using FEM, determine:- 14

- (i) The Nodal displacements.  
(ii) The stresses in each element.  
(iii) The reaction forces at the supports.



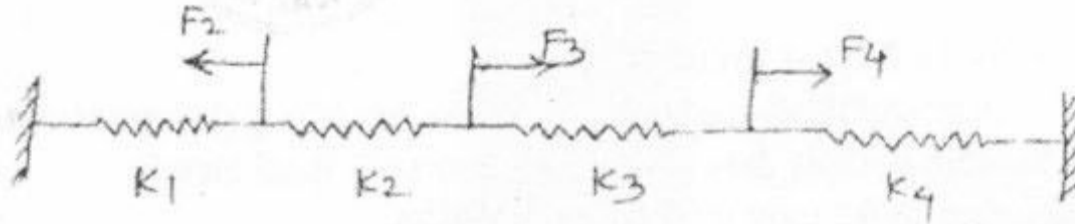
(b) Explain Windowing and clipping. Also explain any one hidden surface removal algorithm. 06

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4. (a) Find for the following problem :

14

- (i) Nodal displacements
- (ii) Reaction forces
- (iii) Force in each spring.



$K_1 = 10 \text{ N/mm}$ ,  $K_2 = 15 \text{ N/mm}$ ,  $K_3 = 25 \text{ N/mm}$ ,  $K_4 = 20 \text{ N/mm}$ ,  $F_2 = 20 \text{ N}$ ,  $F_3 = 30 \text{ N}$ ,  $F_4 = 50 \text{ N}$ .

(b) Formulate stiffness matrix for the Beam element using potential energy approach. 06

5. (a) Explain B-rep and CSG types of solid modelling with examples. 10

(b) Construct a Bezier curve of order three and with vertices: A (1, 2), B (2, 4) C (4, 7) and D (7, 3). 10

6. Write short notes on :- 20

- (a) H-method and P-method in FEA.
- (b) Raster Scan Graphics.
- (c) Mesh compatibility in FEA.
- (d) Functions of a graphics package.

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