Comp Aided Design & Finite Element Analysis / TE / V / PROD (CBGS) / 18.11.15

QP Code : 5561

(3 Hours)

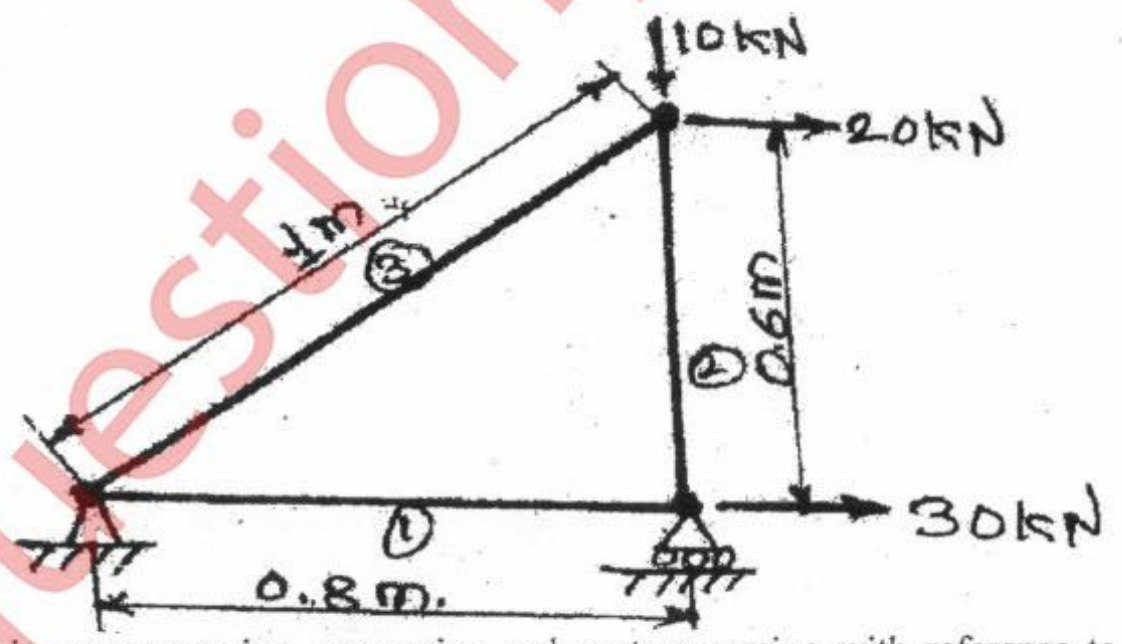
[Total Marks: 80]

N.B. (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**.

Q.1. Write Short notes on the following: -- 20
(a) 3D Transformations.
(b) General rules of mesh generation for Finite Element formulation.
(c) Product life cycle with CAD overlay.
(d) Penalty approach used in FEM.

Q.2. (a) What is product data exchange? List various data exchange formats available in the market. Explain any one in detail. 12
(b) Compare DDA and Bresenham's algorithm. 8

Q.3. (a) A three bar truss made of steel (E = 200 KN/mm^2) is subjected to the horizontal forces of 30 KN and 20 KN, and the vertical force of 10 KN as shown in figure below. The cross-sectional area of each element is 300 mm^2. Using FEM, determine :- 12
(i) The Nodal displacements.
(ii) The stresses in 'each element.
(iii) The reaction forces at the supports.

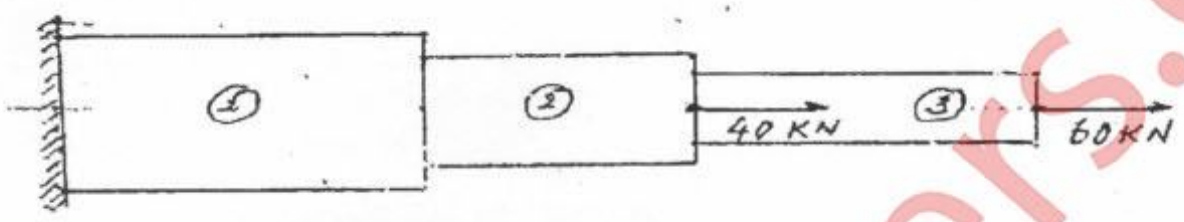


(b) Explain pre-processing, processing and post-processing with reference to FEM software. 8

Q.4. (a) Consider the bar shown in Figure below. An axial load $P_1 = 40 \times 10^3$ N and $P_2 = 60 \times 10^3$ N is applied as shown. The modulus of elasticity is E = 140 x 15

10^9 N/m^2 and areas of the three portions are $A_1 = 70$ mm^2, $A_2 = 60$ mm^2 and $A_3 = 40$ mm^2 respectively. The lengths of the three portions are $L_1 = 50$mm, $L_2 = 30$mm and L3 = 40mm respectively. The load P_1 is applied at the start and P_2, at the end of portion 3. Using the elimination approach for handling boundary conditions, do the following:

(a) Determine the nodal displacements.
(b) Determine the stress in each material.
(c) Determine the reaction forces.
(d) Strain in each element.



(b) Formulate stiffness matrix for the Beam element. 5

Q.5. (a) Explain any one algorithm for polygon filling. 10
(b) Derive a transformation matrix for rotating an object about the axis passing through the origin and point (8, 0,10). 10

Q.6. Write short notes on :- 20
(a) Applications of F.E.A.
(b) Window and viewport transformation.
(c) Mesh compatibility in FEA.
(d) CSG approach and B-rep approach.