Sem - V / Prod / CAD / FEA / CBGS / 11-05-16

Computer Aided Design & Finite Element Analysis

QP Code : 31043

(3 Hours)

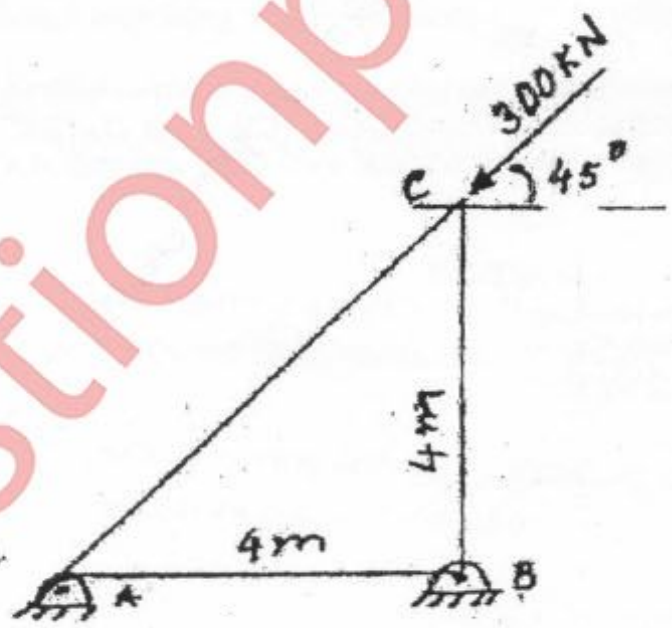
[Total Marks: 80]

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) Input and Output devices in CAD.
(b) Explain sources of error in F.E.A. Solution.
(c) Explain in short the properties of B-spline curves.
(d) Applications of finite element method.

Q.2. (a) Find the raster locations of a line from (2, 5) to (11, 13) using DDA algorithm. Also Draw a sketch showing all pixel locations. 12
(b) Compare DDA and Bresenham's algorithm. 8

Q.3. (a) Consider a three member truss as shown in the figure below. All members of the truss have identical areas of cross section 'A'= 400 mm^2 and E = 3 x 10^5 N/mm^2. Determine the horizontal and vertical displacement of point 'C' and reactions at the supports by using FEA. 12



(b) Formulate a global stiffness matrix for a three nodes linear element considering thermal stresses. 8

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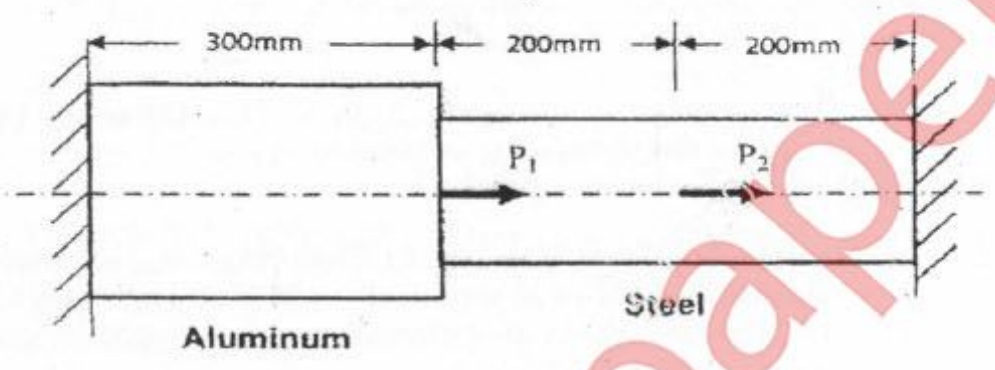
Q.4. (a) Consider the bar shown in Figure below. An axial load $P_1 = 200 \times 10^3$ N, $P_2 = 100 \times 10^3$ N is applied as shown. The area and modulus of elasticity for aluminium portion are $A_{Al} = 2400$ mm^2 and $E_{Al} = 70 \times 10^9$ N/m^2 respectively whereas for steel portion are $A_{st} = 600$ mm^2 and Est $= 200 \times 10^9$ N/m^2 respectively. The lengths of aluminium and steel portions are 300 mm and 400 mm respectively. The load P_1 is applied at the start and P_2, midway on the steel portion. Using the elimination approach for handling boundary conditions, do the following: 15

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



(b) Briefly describe the data structure used in geometric modeling. 5

Q.5. (a) Explain Cohen-Sutherland line-clipping algorithm with illustrations. 10
(b) Find transformation of a quadrilateral A (1, 1), B (3, 2), C (4, 6), D (2, 5) by rotating 45° about origin and then translating one unit in x and y directions. 10

Q.6. Write short notes on :- 20
(a) Merits and demerits of F.E.A.
(b) Geometric modelling.
(c) Mesh compatibility in FEA.
(d) Raster scan graphics.
