Total No. of Questions : 8]

SEAT No. :

P7661

[Total No. of Pages : 4

[6180]-185

T.E. (Mechanical Engineering)

COMPUTER AIDED ENGINEERING

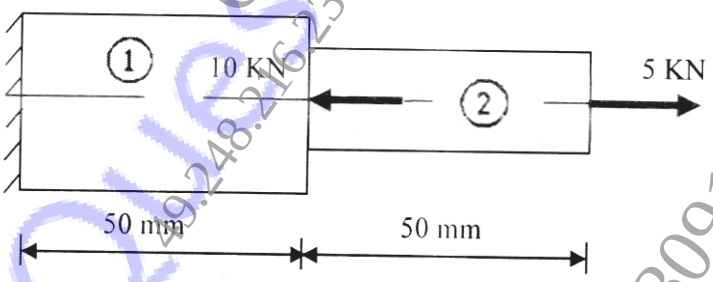
(2019 Pattern) (Semester-II) (302050)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Solve questions Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Use of drawing instruments, electronic pocket calculators are allowed.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data if necessary.***

Q1) a) Find nodal displacement, Stresses in each element and reactions at support in stepped bimetallic bar shown in figure. The forces acting at center and the end of bar is 10kN and 5kN respectively. Use following data: $A_1=150mm^2$; $A_2=100mm^2$; $E_1=200\times10^3$ N/mm^2; $E_2=70\times10^3$ N/mm^2 **[8]**

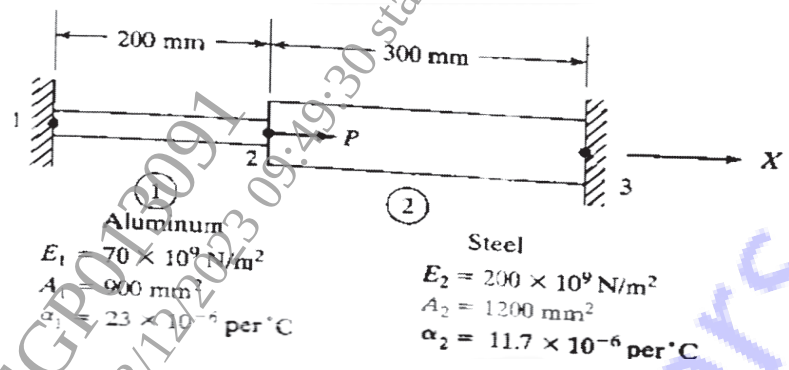


b) An axial load $P=300\times10^3$N is applied at 20ºC to the rod as shown in figure. The temperature is then raised to 60ºC. **[9]**

i) Assemble the K and F matrices.

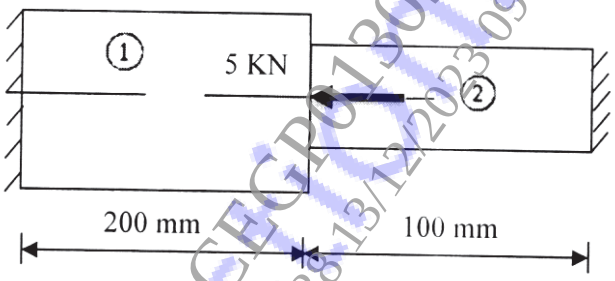
P.T.O.

ii) Determine the nodal displacement and element stresses

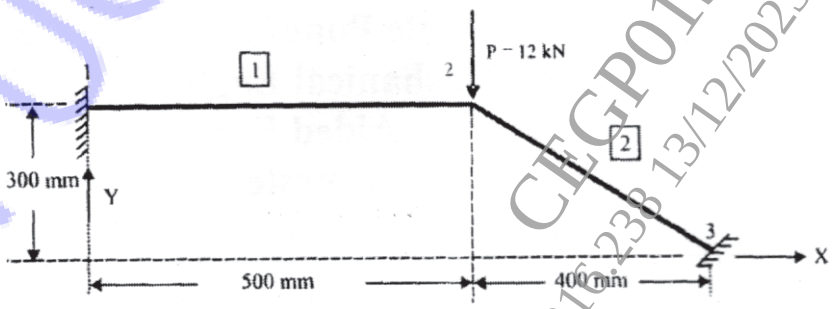


OR

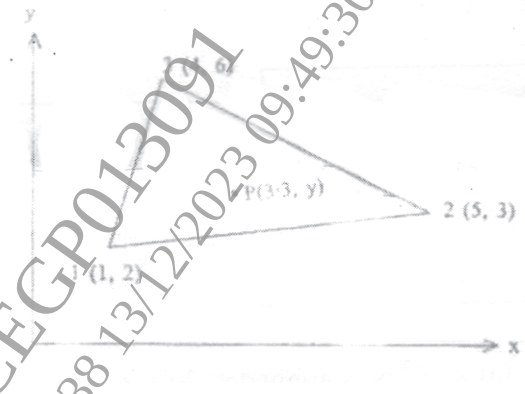
Q2) a) Determine the nodal displacement and element stresses for stepped bar shown in figure. Use following data: A_1=500 mm² ; A_2=250 mm²; E_1=70×10³N/mm²; E_2=200×10³N/mm² **[8]**



b) Determine the nodal displacements and element stresses in the truss structure shown below, assuming points 1 and 3 are fixed. Use E=70 GPa and A=200mm². **[9]**



Q3) a) The nodal coordinate of triangular element are shown in the figure. At the interior point 'P' the x-coordinate is 3.3. N1=0.3. Determine N2, N3 and the y-coordinate of point P. **[6]**



b) What are the modifications are suggested based on the interpretation of results during post processing in CEA? **[6]**

c) Explain the tricks for post processing in computer aided engineering. **[5]**

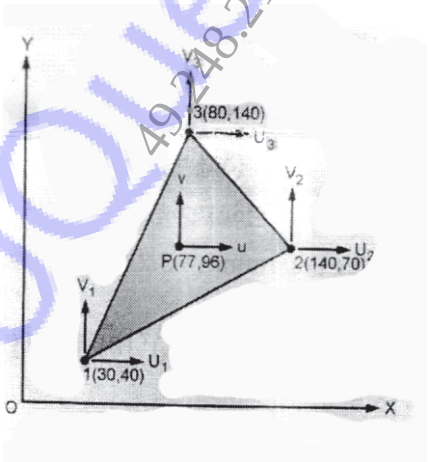
OR

Q4) a) In a triangular element, the nodes 1,2 and 3 have Cartesian coordinates: (30,40), (14,70) and (80,140) respectively. The displacement in mm at nodes 1,2 and 3 are (0.1,0.5), (0.6,0.5) and (0.4,0.3) respectively.The point P within the element has Cartesian coordinates (77,96). For point P, determine: **[6]**

i) The natural coordinates.

ii) The shape functions.

iii) The displacement of point P



b) How to verify and validate results in CAE post-processing? **[6]**

c) What are the steps for interpretation of results during post processing in finite element analysis? **[5]**

Q5) a) Give comparison of Linear and Nonlinear Analysis CAE Problems with respect to its characteristics features-Load-displacement relation. stress-strain relation, scalability, Stress-strain measures, superposition, reversibility, Solution scheme, computational time and user interaction with software. **[6]**

b) What are the different kinds of geometric non-linearities in CAE project? Explain with figures. **[6]**

c) Write a general procedure for Non-linear static analysis project. **[6]**

OR

Q6) a) Explain difference between static analysis and dynamic analysis. **[6]**

b) Explain free and forced vibration. **[6]**

c) Explain modal analysis, harmonic analysis and transient analysis to study the dynamic properties of the structures. **[6]**

Q7) a) What is Computational Fluid Dynamics (CFD)? Explain the three dimension of fluid dynamics. **[6]**

b) Discuss the concept of FEA for structural dynamics and acoustics used in NVH analysis. **[6]**

c) Enlist the CAE software used for different application of CAE. Write at least 6 software with their applications. **[6]**

OR

Q8) a) What is durability, reliability and fatigue? Explain S-N Curve with low cycle, high cycle and infinite fatigue life. **[6]**

b) Write typical application of computation fluid dynamics in various industries for the following domains: **[6]**

i) Aerospace Engineering

ii) Automobile Engineering

iii) Civil Engineering

c) Explain use of FEA to optimize plastic injection mold materials. **[6]**

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