Total No. of Questions : 8]

SEAT No. :

PE2628

[Total No. of Pages : 4

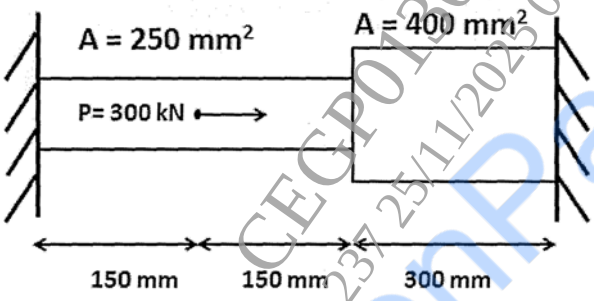
[6583]-160
T.E. (Mechanical)
COMPUTER AIDED ENGINEERING
(2019 Pattern) (Semester - VI) (302050)

Time : 2½ Hours] *[Max. Marks : 70*

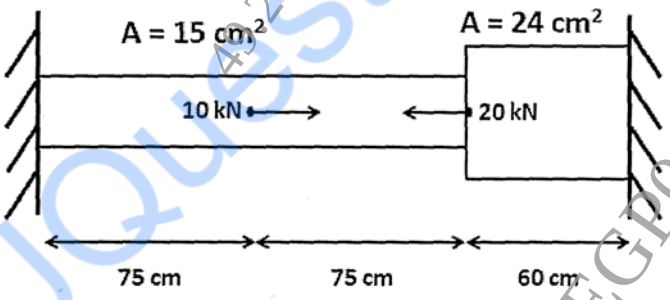
Instructions to the candidates:

1) ***Answer 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) ***Figures to the right indicate full marks.***
4) ***Assume suitable data wherever necessary.***

Q1) a) A stepped bar subjected to an axial load of 300 kN as shown in figure. Find the nodal displacement, element stress and support reaction. Consider E = 200 GPa **[12]**



b) For a stepped bar as shown in figure determine load vector. **[6]**



Consider : $E = 20 \times 10^6 N/cm^2$

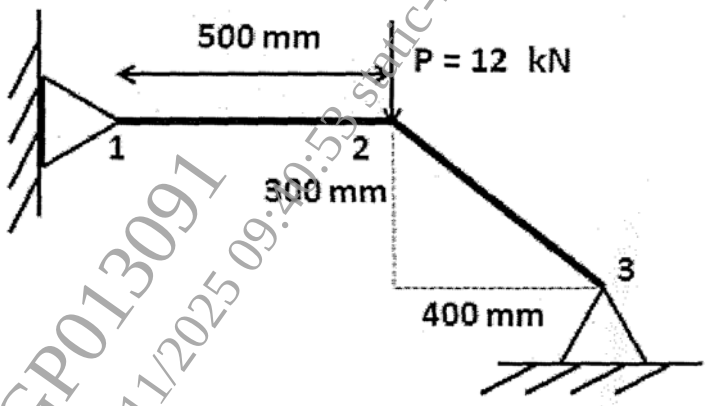
$\Delta t = 10^oC$

$\alpha = 11 \times 10^{-6}$ cm/cm^oC

OR

P.T.O.

Q2) a) For the two bar truss element determine the displacements at node 2. **[12]**



For both element consider

E = 70 Gpa

A = 200 mm^2

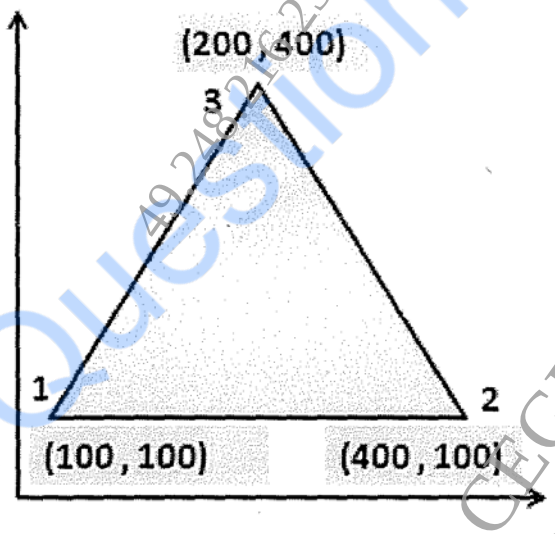
b) State and explain the concept of minimum potential energy approach. **[6]**

Q3) a) For the place stress element the nodal displacement are **[12]**

u_1 = 2.0 mm, u_2 = 1.0 mm u_3 =2.5 mm

v_1= 1.0 mm V_2= 1.5 mm V_3= 0.5 mm

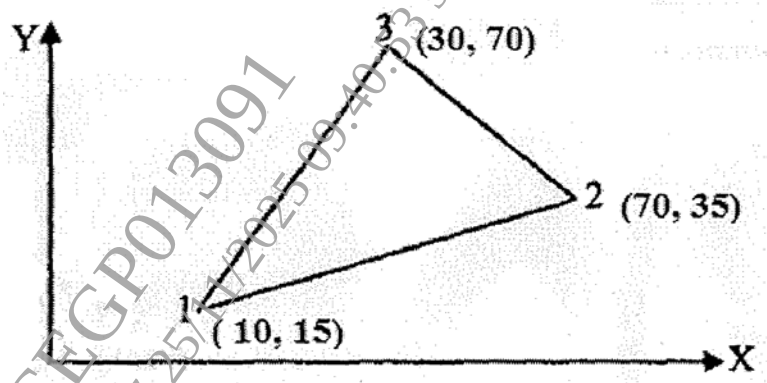
Determine element stress. Assume E = 200 GN/m^2 μ = 0.3.



b) How to verify (check) accuracy and validate the result in Computer Aided Engineering? **[6]**

OR

Q4) a) A CST element has nodal coordinates are (10, 15), (70, 35) and (30, 70) for node 1, 2 and 3 respectively. The element has material property as E = 200 GPa and μ = 0.3. **[12]**



The deflection observed in these nodes are;

$u_1 = 0.01$ mm, $u_2 = 0.03$ mm $u_3 = -0.02$ mm

$v_1 = -0.02$ mm $V_2 = 0.02$ mm $V_3 = 0.05$ mm

Assume Plane stress condition.

Determine:

i) The Stresses

ii) The stains

b) How to interpret the CAE result and what modifications are suggested based on it. **[6]**

Q5) a) What is nonlinearity? What are the different kinds of geometric non-linearities in CAE project? Explain with figures. **[9]**

b) Describe the solution techniques for nonlinear analysis. **[8]**

OR

Q6) a) Explain modal analysis, harmonic analysis and transient analysis to study the dynamic properties of the structures. **[9]**

b) Explain the following terms in dynamic analysis **[8]**

- Time domain analysis
- Frequency domain analysis

Q7) a) What are the Benefits of CFD Analysis? Also explain its application in following industry. **[9]**

- Aircraft industry
- Automobile industry
- Civil industry

b) What is durability, reliability and fatigue? Explain S-N Curve with low cycle, high cycle fatigue life. **[8]**

OR

Q8) a) Explain in detail what different types of analysis need to be consider while making a motor car. **[9]**

b) Elaborate the use of CAE in casting and sheet metal simulations. **[8]**