CBCS Scheme

USN | | | | | | | | | |

15ME61

Sixth Semester B.E. Degree Examination,June/July 2018

Finite Element Method - Model Question paper-1

Time:3 hrs Max marks: 80

Note:Answer any FIVE full questions, choosing one full question from each module

Module-1

1 a. Explain the steps involved in FEM**.** **(08 Marks)**

b. Explain principle of Minimum potential energy. **(08 Marks)**

OR

2 a. Write the equations of equilibrium and strain displacement equation for 3D elastic problem. **(08 Marks)**

b. Explain plane stress and plane strain problems **(08 Marks)**

Module-2

3 a. Derive shape function of CST element using natural coordinate system. **(08 Marks)**

b. Briefly explain Iso parametric, Sub parametric and Super parametric element.**(08 Marks)**

OR

4 a. A Stepped composite bar is loaded as shown in the Fig (Q.4).Determine the nodal displacementsin the bar. P=200kN **(08 Marks)**

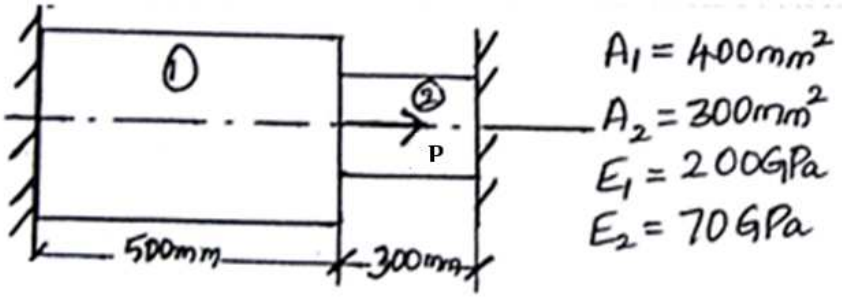


Fig.Q.4 (a)

b. Solve the truss problem for nodal unknowns as shown in the Fig(Q.8)**(08 Marks)**

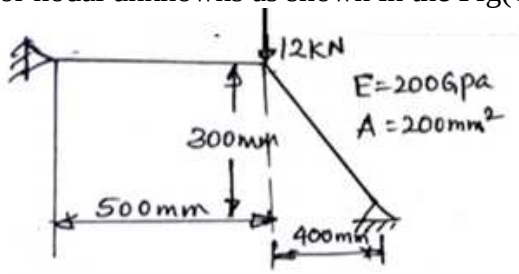


Fig Q.4(b)

Module-3

5 Solve for slopes, at point 2 and 3, using beam elements for the structure shown in Fig.Q.5. Also determine the deflection at the center of the portion of the beam carrying UDL.

(16 Marks)

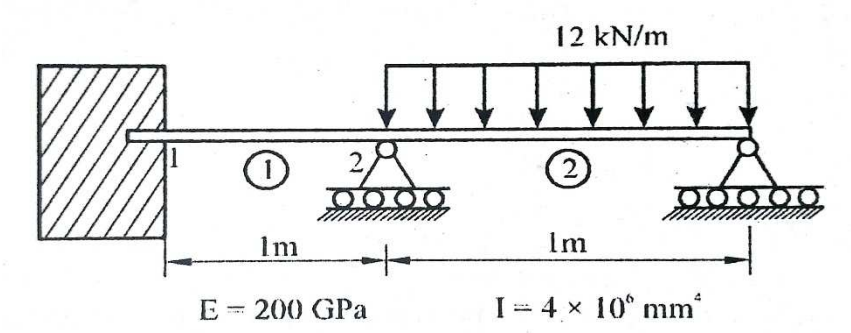


Fig.Q.5

OR

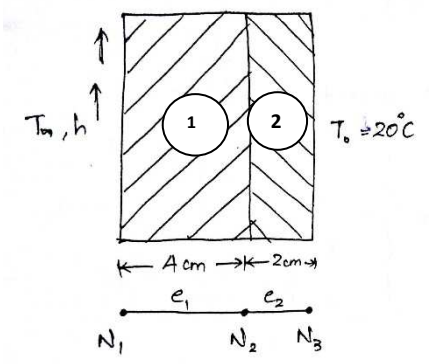
6 a. Formulate stiffness matrix for the shaft subjected to torque **(08Marks)**

b. A solid stepped shaft is subjected to torque of 2kN-m at its free end and a torque of 5kN-m at its change in cross section. Determine the angle of twists and shear stresses induced in the steel shaft. The material of the shaft is made of steel whose G= 80GPa. **(08Marks)**

Module-4

7 Determine the temperature distribution through the composite wall as shown in the Fig(Q.7)

(16 Marks)



$K_1 = 0.05 W/cm-^0C$

$K_2 = 0.1 W/cm-^0C$

$T_\infty = -5^0C$

$h = 0.1\ W/cm^2-^0C$

Fig Q.7

OR

8 A metallic fin with thermal conductivity of $70W/cm-^oC$ of 0.5cm radius and 5cm long extends from a plate whose temperature is 140^0C.Determine the temperature distribution along the fin if heat transferred to ambient air at 20^0C with convection coefficient of$5W/cm^2-^0C$.Take two elements along the fin and the first element is insulated.

(16 Marks)

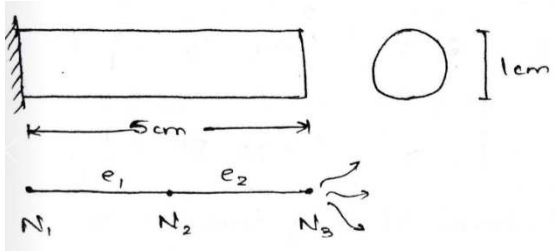


Fig Q.8

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9 Derive stiffness matrix of a axisymmetric body with triangular elements **(16 Marks)**

OR

10 a. Derive consistent element mass matrix for one dimensional bar element **(08Marks)**

b. Derive consistent element mass matrix for truss element. **(08Marks)**

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