Code No: J8701/R16

M. Tech. II Semester Supplementary Examinations, October-2021

FINITE ELEMENT METHOD/FINITE ELEMENT ANALYSIS

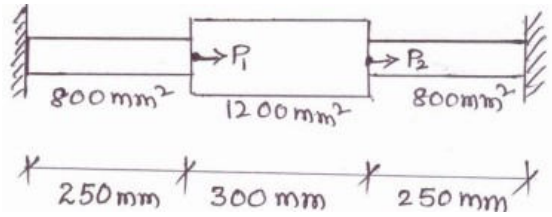
Common to Structural Engineering (87), Structural Design(85),Soil Mechanics & Foundation Engineering(19),Geotechnical Engineering(20)and Computer Aided Structural Engineering (35)

Time: 3 Hours **Max. Marks: 60**

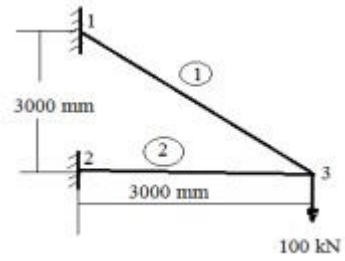
Answer any FIVE Questions
All Questions Carry Equal Marks

1. a Using principle of total potential energy explain how to you formulate element equations 6M
   b Explain the following: i) variational approach ii) weighted residual methods. 6M

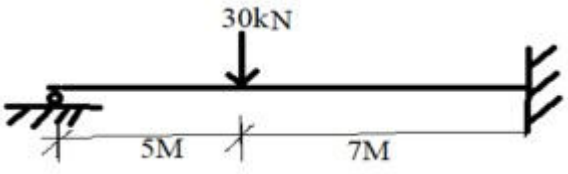
2 Determine the stresses for the given assembly as shown in fig. P_1=200 kN, P_2=400 kN, E=70 kN/mm^2 12M



3. For the two-bar truss shown in figure, determine the displacements and stress. A1=500mm^2 , A2=1200mm^2 , E=2x10^5 N/mm^2 . 12M



4. For the beam shown in figure below, determine the nodal displacements. Given E = 200 GPa and I = 8000 cm4 12M



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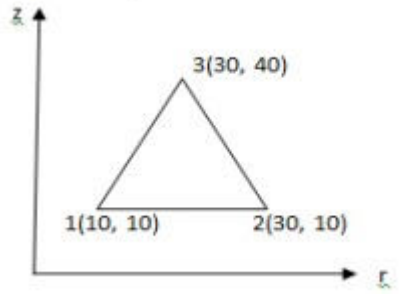
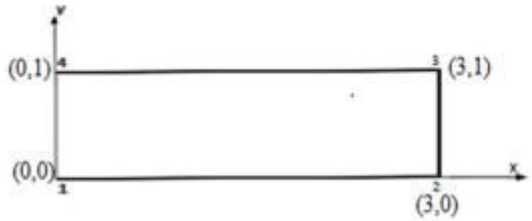
5. a Discuss the convergence requirements and mesh generation? 6M
   b Nodal coordinates for an Axi-Symmetric element are given below. Evaluate Stiffness Matrix. E=2x10^5 N/mm^2 , υ = 0.25 6M



6. a The nodal displacements of a four-noded quadrilateral element shown Fig. are given as: U = [0.0 0.0 0.02 0.03 0.06 0.015 0.10 0.0]^T cm. Take E=20×10^6 N/cm^2 and υ=0.25. Determine Jacobian, strain-displacement matrix and elasticity matrix assuming plane stress condition. All coordinates are in cm. 6M



   b Prove that the product of Jacobian and inverse Jacobian is a unity matrix. 6M

7. A simply supported beam of span L, young's modulus, moment of inertia I is subjected to a uniformly distributed load of P/unit length. Determine the deflection W at the mid-span. Use Rayleigh Ritz method. 12M

8. a Briefly discuss the discretization process and types of elements used discretization? 6M
   b Write the properties of shape functions and support your answer with one example 6M

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