CBCS SCHEME

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18CSE22

Second Semester M.Tech. Degree Examination, June/July 2024
Finite Element Method of Analysis

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Explain the terms plane stress and plain strain method with relevant equations. **(10 Marks)**

b. Obtain an expression for deflection at free end for a cantilever beam of span 'ℓ' mt subjected to a point load at free end, using Rayleigh–Ritz method choose polynomial as a trial function. **(10 Marks)**

OR

2 a. Explain the steps involved in FEM of structural analysis. **(12 Marks)**

b. Explain the principle of minimum potential energy. **(04 Marks)**

c. Explain briefly element aspect ratio. **(04 Marks)**

Module-2

3 a. Derive shape function for a 3-noded bar element and 5-noded element using Lagrange's interpolation plot the variation of shape functions. **(12 Marks)**

b. Explain the following :
i) Local coordinate's
ii) Global coordinates
iii) Natural coordinates. **(08 Marks)**

OR

4 a. Determine the shape function for a 3 noded CST element in Cartesian coordinate from the first principle. **(10 Marks)**

b. Briefly explain convergence requirements for a good displacement function. **(10 Marks)**

Module-3

5 Derive the shape function [N] in natural co-ordinates and also derive strain–displacement matrix [B] for a CST (Constant Strain Triangle) element. **(20 Marks)**

OR

6 a. Using Gaussian quadrature formula, evaluate $I = \int_{-1}^{+1} (1 + r + 2r^2 + 3r^3) dr$. **(10 Marks)**

b. Define isoparametric, subparametric and superparametric elements. **(06 Marks)**

c. Obtain Jacobian for the triangular element as shown in Fig.Q6(c). **(04 Marks)**

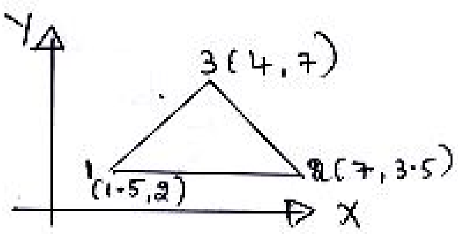

Fig.Q6(c)

Module-4

7 Analyze the beam shown in Fig Q7, by FEM and determine the reactions.

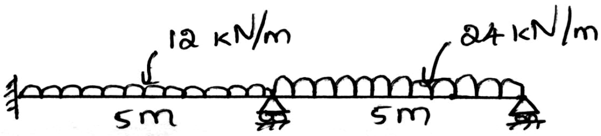

Fig Q7. **(20 Marks)**

OR

8 Determine the Nodal displacement for the truss shown in Fig Q8. Take $E = 2 \times 10^5$ MPa.

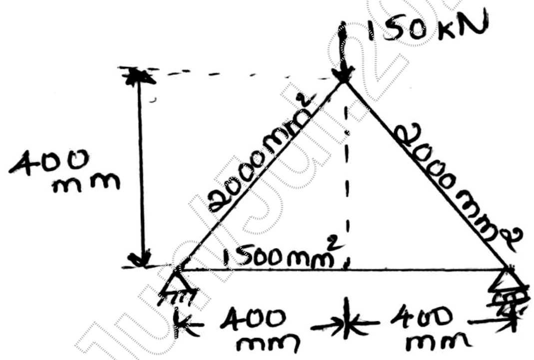

Fig Q8 **(20 Marks)**

Module-5

9 Explain the following plate bending elements.

i) 12 DOF element
ii) 16 DOF element
iii) Mindlin's plate bending element. **(20 Marks)**

OR

10 a. Explain in detail the material non linearity and geometric non linearity. **(12 Marks)**
b. Discuss three classes of displacement functions used for plate bending problem. **(08 Marks)**

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