

23278

M. Tech. 2nd Semester Civil Engg.

(Transportation Engg.)

Examination, July-2022

FINITE ELEMENT METHOD

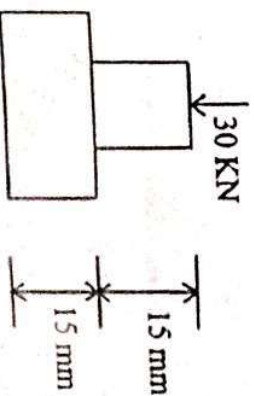
Paper-CE-604

Time allowed : 3 hours]

[Maximum marks : 100

Note : Attempt any five questions. All questions carry equal marks.

1. Explain the mathematical interpretation of the Finite Element Method for one dimensional field problems. 20
2. (a) Write down six 3D strain-displacement equations. 10
(b) Explain the Principle of Minimum Potential Energy. 10
3. Determine the nodal displacement, stress and strain for the bar shown in figure. The area of cross-section of lower portion is twice of the upper portion. The elastic modulus of the bar is E. 20



23278-P-3-Q-8 (22)

[P.T.O.]

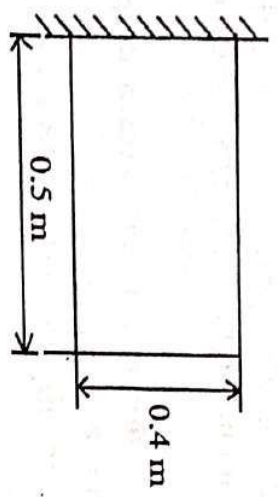
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23278

4. Describe Galerkin's and Rayleigh Ritz method with suitable example. 20

5. Compute the steady state temperature distributions in the plate shown in figure below by discretizing the domain of interest using triangular elements. 20

Assume ; $T_{\alpha} = 25^{\circ}\text{C}$, $h = 50 \text{ W/m}^2\text{C}$, $k = 1.5 \text{ W/m}^{\circ}\text{C}$.



6. (a) Explain the isoparametric concept in Finite Element Analysis. 10

(b) Explain the terms isoparametric, sub parametric and superparametric elements. 10

7. A beam of length 10 m, fixed at one end and supported by a roller at the other end carries a 20 kN concentrated load at the centre of the span. By taking the modulus of

23278

(3)

23278

elasticity of material as 200 GPa and Moment of Inertia as $24 \times 10^{-6} \text{ m}^4$, determine – 20

(i) Deflection under load

(ii) Shear Force and Bending Moment at mid span

(iii) Reaction at supports

8. (a) Describe in details about : 10

(i) Triangular elements

(ii) Quadrilateral elements

(b) Explain briefly the concept of 3D modelling. 10

23278