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Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 21861

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2015.

Sixth Semester

Mechanical Engineering

ME 2353/ME 63/10122 ME 605 – FINITE ELEMENT ANALYSIS

(Common to Automobile Engineering, Mechanical and Automation Engineering, Industrial Engineering and Management)

(Regulations 2008/2010)

Time : Three hours Maximum : 100 marks

(Any missing data may be suitably assumed)

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is meant by node?

2. What is Rayleigh- Ritz method?

3. What is discretization?

4. Write down the expression of stiffness matrix for a truss element.

5. What is CST element?

6. Define plane strain analysis.

7. Define dynamic analysis.

8. What is meant by transverse vibrations?

9. Mention two natural boundary conditions as applied to thermal problems.

10. Define stream line.

PART B — ($5 \times 16 = 80$ marks)

11. (a) Write briefly about weighted residual methods. (16)

Or

(b) A simply supported beam is subjected to uniformly distributed load over entire span as shown in Fig. Q. 11(b). Determine the bending moment and deflection at midspan by using Rayleigh Ritz method. (16)

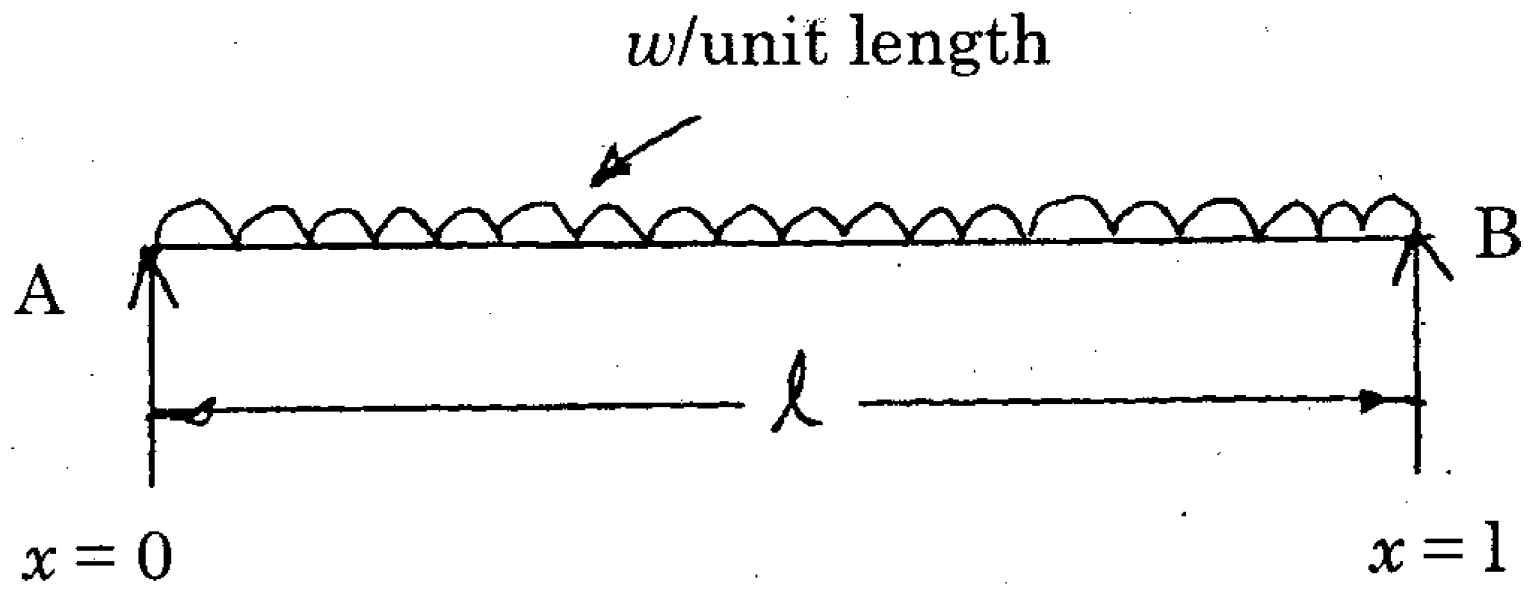

Fig Q. 11(b)

12. (a) A steel bar of length 800 mm is subjected to an axial load of 3 kN as shown in Fig. Q. 12(a). Find the elongation of the bar, neglecting self weight. (16)

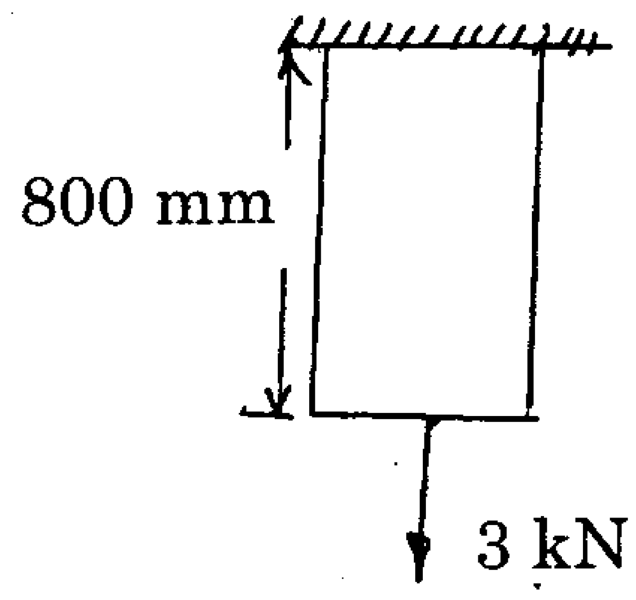

Fig. Q. 12(a)

Or

(b) Derive the stiffness matrix for 2D truss element. (16)

13. (a) For the constant strain triangular element shown in Fig. Q.13(a) assemble strain-displacement matrix. Take t = 20 mm and $E = 2 \times 10^5$ N/mm^2. (16)

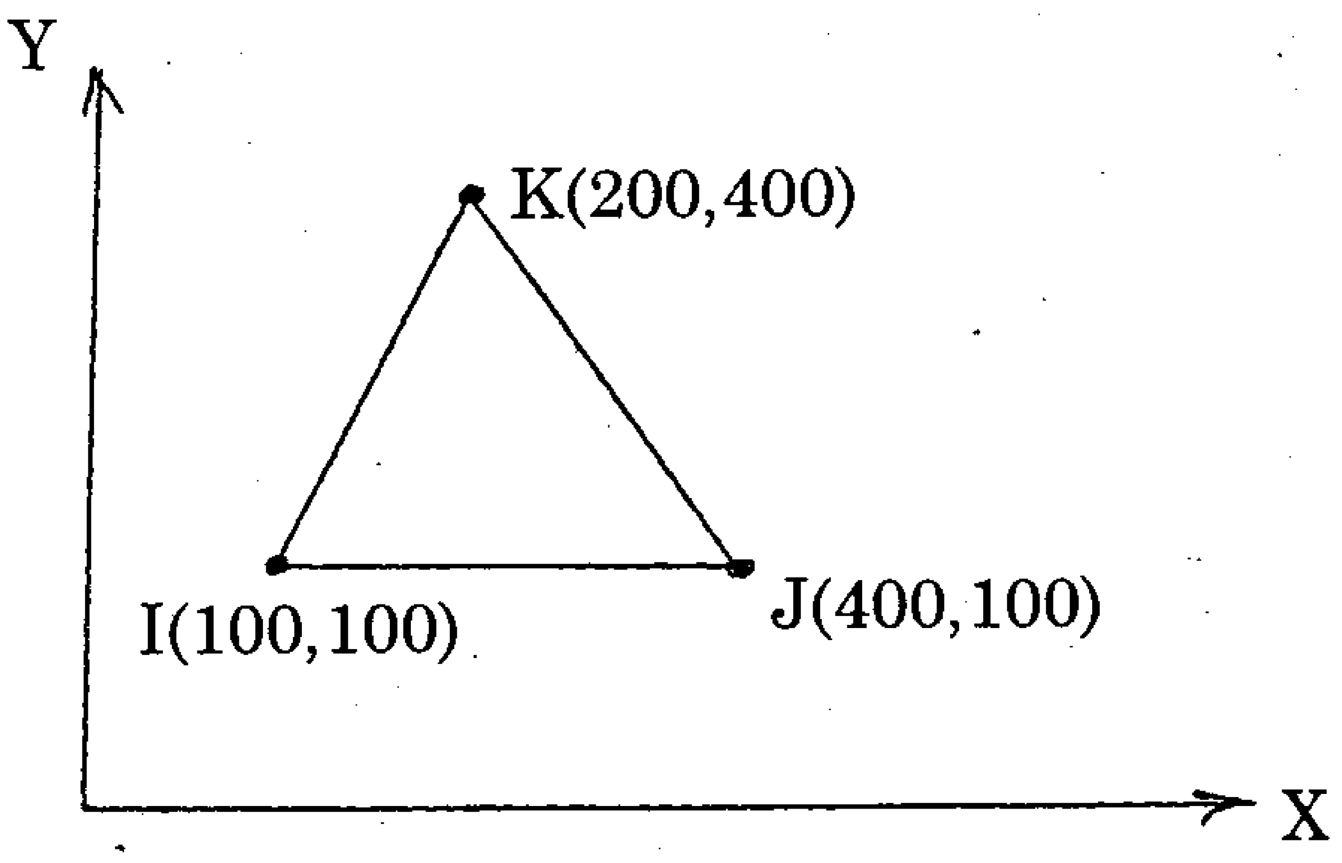

Fig. Q.13(a)

Or

(b) For the isoparametric four noded quadrilateral element shown in Figure Q.13(b), determine the cartesian co-ordinates of point P which has local co-ordinates $\varepsilon = 0.5$ and $\eta = 0.5$. (16)

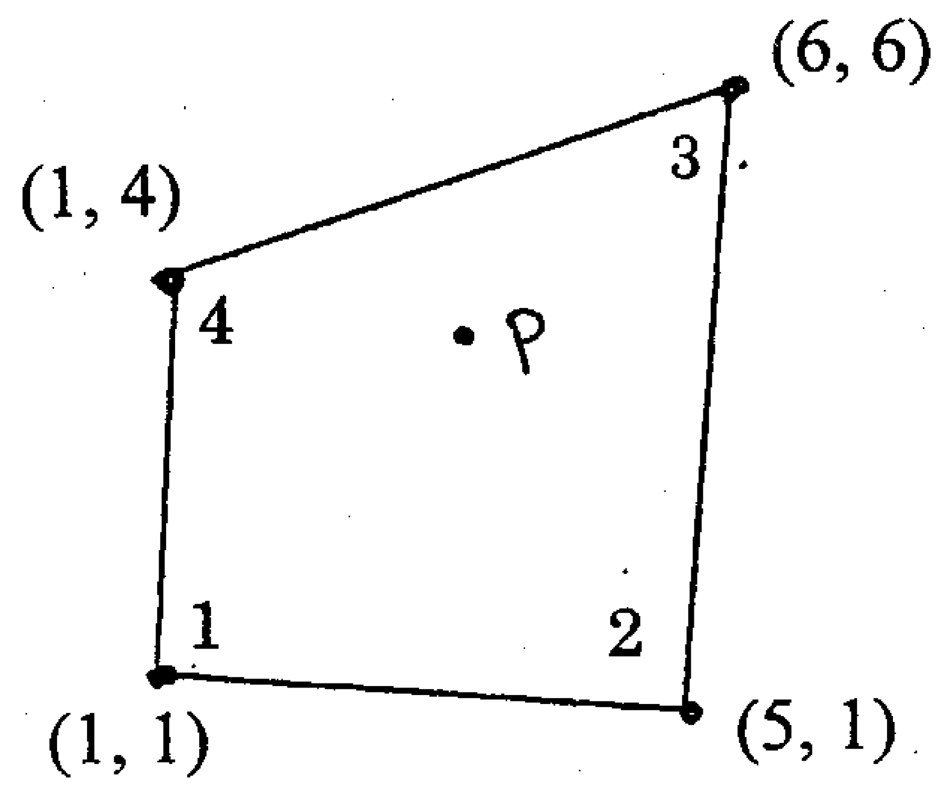

Fig. Q.13(b)

14. (a) For the bar as shown in Fig. Q.14(a) with length 2L, modulus of elasticity E, mass density e, and cross sectional area A, determine the first two natural frequencies. (16)

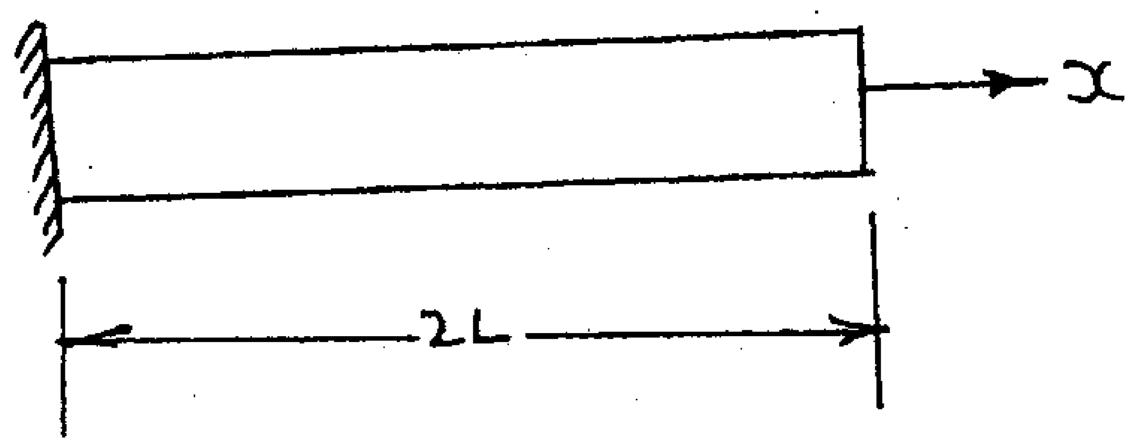

Fig. Q.14(a)

Or

(b) Determine the eigen values and natural frequencies of a system whose stiffness and mass matrices are given below. (16)

$$[K] = \frac{2AE}{L}\begin{bmatrix} 3 & -1 \\ -1 & 1 \end{bmatrix}, m = \frac{\rho AL}{12}\begin{bmatrix} 6 & 1 \\ 1 & 2 \end{bmatrix}$$

15. (a) Derive an expression for temperature function and shape function for one dimensional heat conduction element. (16)

Or

(b) Derive the stiffness matrix and load vectors for fluid mechanics in two dimensional finite element. (16)
