

Roll No .....

**MVSE-301(A)**  
**M.E./M.Tech., III Semester**  
 Examination, December 2017  
**Advance FEM and Programming**  
 (Elective-I)

Time : Three Hours

Maximum Marks : 70

Note : i) Attempt any five questions.  
 ii) All questions carry equal marks.

1. a) Explain the isoparametric concept in finite element analysis? 7  
 b) Explain the isoparametric elements and their advantages. 7
2. Write short notes on: 14  
 a) Uniqueness of mapping of isoparametric elements  
 b) Jacobian matrix
3. For the element shown in figure 1, assemble Jacobian matrix and strain displacement matrix for the Gaussian point (0.588, 0.588) 14

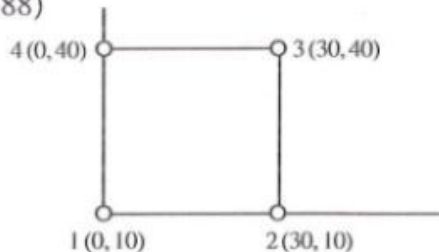
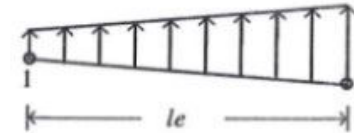


Figure 1

4. Assemble the stiffness matrix for a plane beam element oriented at angle  $\nu$  to the  $x$  axis. Explain its use in FEA. 14

[2]

5. Derive the expression for consistent load, which varies linearly from  $P_1$  at node 1 to node  $P_2$  at node 2 on a beam element of length  $le$ . 14



6. a) Discuss the use of triangular plate bending elements. 7  
 b) Discuss the conforming and non-conforming rectangular plate bending analysis. 7
7. a) Explain the term 'shear locking'. How this problem is overcome? 7  
 b) Write short notes on numerical integration and stress smoothing in the case of four noded quadrilateral plate element. 7
8. Consider axial vibration of the steel bar shown in figure 2. 14

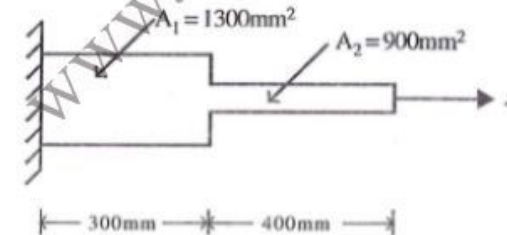


Figure 2 : Steel bar

- a) Develop the global stiffness and mass matrices.
- b) By hand calculations, determine the lowest natural frequency and mode shape using the inverse iteration algorithm.

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