

**III B.Tech I Semester Supplementary Examinations, November 2006**  
**FINITE ELEMENT ANALYSIS**  
**(Mechatronics)**

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions  
 All Questions carry equal marks

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1. (a) Compare FEM with Strength of Material Problem, mentioning suitability of each method with an example.  
 (b) Discuss temperature effects on plane stress and on relationship. [8+8]
2. Discuss various direct and variational formulation methods used in structural analysis with appropriate problem. [16]
3. Consider rectangular element shown below. Assume plane stress condition  $E=200$  GPa;  $\nu=0.3$  GPa.  $N(0, 0, 0.002, 0.003, 0.006, 0.0032, 0, 0)$ tem Evaluate J.B. and  $\sigma$  at  $\xi=0$  and  $\eta=0$ . figure 1 [16]

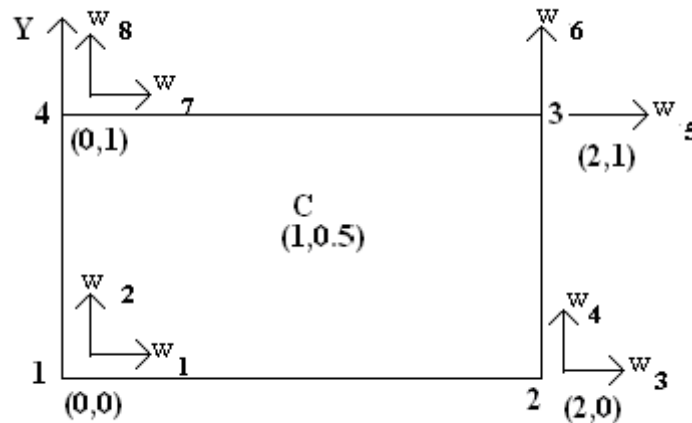


Figure 1:

4. A composite wall consists of three materials as shown in figure 2. Outer temperature  $T_0 = 20^\circ\text{C}$  convection heat transfer takesplace on the inner surface of wall with  $T_\infty=800^\circ\text{C}$  and  $\eta=25 \text{ W/m}^2\text{C}$ . Determine temp distribution in wall. [16]
5. Evaluate shape functions  $N_1, N_2, N_3$  at the interior point P for triangular elements shown figure 3 [16]
6. (a) Discuss role of numerical integration in F.E.M.  
 (b) Distinguish automatic generation of mesh and semiautomatic mesh generation with appropriate examples. [8+8]
7. (a) Discuss evaluation of eigen vectors for beam in FEM.

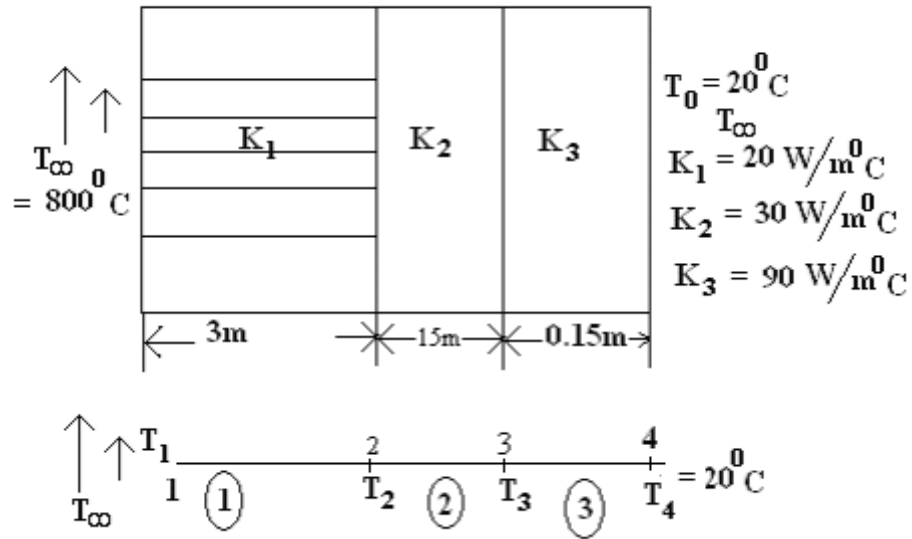


Figure 2:

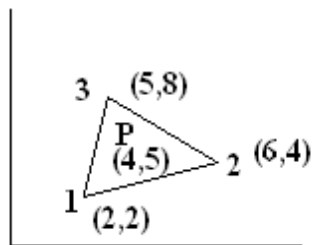


Figure 3:

- (b) Discuss viscous flow problems used in FEM clearly highlighting the governing equations. [8+8]

8. Write short notes on any TWO.

- (a) One dimensional fluid flow problems in FEM  
(b) Temperature effect analysis of trusses.  
(c) Solids of revolution with example. [8+8]

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