

Name: \_\_\_\_\_ Hall Ticket No.

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**Answer All Questions. All Questions Carry Equal Marks. Time: 20 Min. Marks: 10.****I Choose the correct alternative:**

- In a three noded triangular element  $N_1$ ,  $N_2$ , and  $N_3$  are the shape functions which can be expressed in natural coordinates  $\xi$  and  $\eta$  therefore  $N_1$  is equal to [ ]  
 A)  $\eta$  B)  $\xi + \eta$  C)  $\xi$  D)  $\xi - \eta$
- In three dimensional axisymmetric solids strain vector is defined as ' $\epsilon$ ' which is equal to [ ]  
 A)  $[\epsilon_r, \epsilon_z, \gamma_{rz}, \epsilon_\theta]$  B)  $[\sigma_r, \sigma_x, \tau_{xy}, \sigma_z]$  C)  $[\epsilon_r, \epsilon_x, \gamma_{yz}, \epsilon_\theta]$  D) none
- To analyse problems involving curved boundaries or surfaces, the following type of elements are [ ] most suitable elements  
 A) Linear elements B) Isoparametric elements C) 1-D elements D) cubic elements
- Stress in triangular element is given by  $\{\sigma\} = [D] [B] \{Q\}$  where  $\{\sigma\}$  is equal to [ ]  
 A)  $[\sigma_x \ \sigma_y]$  B)  $[\sigma_x \ \sigma_y \ \tau_{xy}]$  C)  $[\sigma_x]$  D)  $[\sigma_y]$
- The values of  $W_i$  and  $\xi_i$  for Gauss quadrature two-point formula are given as [ ]  
 A)  $W_1 = W_2 = 1; \xi_1 = -\xi_2 = \pm 1/\sqrt{3}$  B)  $W_1 = 1; \xi_1 = 1$  C)  $W_1 = 2; \xi_1 = 0$  D)  $W_1 = 0; \xi_1 = 0$
- In the finite element analysis of isoparametric elements the shape functions for general four noded rectangular element (in terms of  $\xi, \eta$ )  $N_2$  is equal to [ ]  
 A)  $(1 + \xi)(1 - \eta)/4$  B)  $(1 + \xi)(1 + \eta)/4$  C)  $(1 - \xi)(1 - \eta)/4$  D)  $(1 - \eta)/4$
- The governing equation for structural dynamics is given by  $[M]\{q''\} + [C]\{q'\} + [K]\{q\} = P(t) + P_b(t) + P_T(t)$ , the term  $[C]$  is known as [ ]  
 A) mass matrix B) stiffness matrix C) displacement matrix D) damping matrix
- Conductance matrix is the equivalent of stiffness matrix in the following analysis [ ]  
 A) Dynamic B) thermal C) fluid flow D) static structural
- The governing equation for convection process is [ ]  
 A)  $q = h A T_s$  B)  $q = h A [T_h - T_s]$  C)  $q = h A T_h$  D)  $q = h A [T_s - T_h]$
- Number of shape functions the quadrilateral plane stress elements will have [ ]  
 A) 8 B) 4 C) 3 D) 2

**II Fill in the blanks**

11. A triangular element in which strain is constant throughout the element is known as \_\_\_\_\_
12. The three dimensional tetrahedron element will have nodes equal to \_\_\_\_\_
13. The consistent matrix for one dimensional bar element is given by \_\_\_\_\_
14. The mode of heat transfer in which the transfer of heat take place from one part of a substance to another part of the same substance is known as \_\_\_\_\_
15. Jacobian [J] for four node Isoparametric element is given by \_\_\_\_\_
16. The elements in which **less** number of nodes is used to define geometry than are used to define the shape function are known as \_\_\_\_\_
17. A fin is an external surface which is added on to a surface to increase the \_\_\_\_\_
18. Element conductivity matrix for 1-D heat conduction element is given by \_\_\_\_\_
19. Units for convection heat transfer coefficient is \_\_\_\_\_
20. An axisymmetric solid sometimes called as \_\_\_\_\_

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- Stress in triangular element is given by  $\{\sigma\} = [D] [B] \{Q\}$  where  $\{\sigma\}$  is equal to [ ]  
 A)  $\begin{bmatrix} \sigma_x & \sigma_y \end{bmatrix}$  B)  $\begin{bmatrix} \sigma_x & \sigma_y & \tau_{xy} \end{bmatrix}$  C)  $\begin{bmatrix} \sigma_x \end{bmatrix}$  D)  $\begin{bmatrix} \sigma_y \end{bmatrix}$
- The values of  $W_i$  and  $\xi_i$  for Gauss quadrature two-point formula are given as [ ]  
 A)  $W_1 = W_2 = 1; \xi_1 = -1/\sqrt{3}, \xi_2 = 1/\sqrt{3}$  B)  $W_1 = 1; \xi_1 = 1$  C)  $W_1 = 2; \xi_1 = 0$  D)  $W_1 = 0; \xi_1 = 0$
- In the finite element analysis of isoparametric elements the shape functions for general four noded rectangular element (in terms of  $\xi, \eta$ )  $N_2$  is equal to [ ]  
 A)  $(1+\xi)(1-\eta)/4$  B)  $(1-\xi)(1+\eta)/4$  C)  $(1-\xi)(1-\eta)/4$  D)  $(1+\eta)/4$
- The governing equation for structural dynamics is given by  $[M]\{\ddot{q}\} + [C]\{\dot{q}\} + [K]\{q\} = P(t) + P_b(t) + P_T(t)$ , the term  $[C]$  is known as [ ]  
 A) mass matrix B) stiffness matrix C) displacement matrix D) damping matrix
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 A)  $\begin{bmatrix} \epsilon_r & \epsilon_z & \gamma_{rz} & \epsilon_\theta \end{bmatrix}$  B)  $\begin{bmatrix} \sigma_r & \sigma_x & \tau_{xy} & \sigma_z \end{bmatrix}$  C)  $\begin{bmatrix} \epsilon_r & \epsilon_x & \gamma_{yz} & \epsilon_\theta \end{bmatrix}$  D) none
- To analyse problems involving curved boundaries or surfaces, the following type of elements are [ ] most suitable elements  
 A) Linear elements B) Isoparametric elements C) 1-D elements D) cubic elements

**II Fill in the blanks**

11. The mode of heat transfer in which the transfer of heat take place from one part of a substance to another part of the same substance is known as \_\_\_\_\_
12. Jacobian [J] for four node Isoparametric element is given by \_\_\_\_\_
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14. A fin is an external surface which is added on to a surface to increase the \_\_\_\_\_
15. Element conductivity matrix for 1-D heat conduction element is given by \_\_\_\_\_
16. Units for convection heat transfer coefficient is \_\_\_\_\_
17. An axisymmetric solid sometimes called as \_\_\_\_\_
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- In the finite element analysis of isoparametric elements the shape functions for general four noded rectangular element (in terms of  $\xi$ ,  $\eta$ )  $N_2$  is equal to [ ]  
 A)  $(1+\xi)(1-\eta)/4$  B)  $(1-\xi)(1+\eta)/4$  C)  $(1-\xi)(1-\eta)/4$  D)  $(1+\xi)(1+\eta)/4$
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