Reg. No. \_\_\_\_\_\_\_\_\_\_\_\_\_



**End Semester Examination – Nov / Dec – 2019**

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| **Code :** | **18CE3013** | **Duration :** | **3hrs** |
| **Sub. Name :** | **FINITE ELEMENT METHODS IN STRUCTURAL ENGINEERING** | **Max. Marks :** | **100** |

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| **Q. No.** | **Sub Div.** | **Questions** | **Course Outcome** | **Marks** |
| **ANSWER ANY FIVE QUESTIONS (5 x 16 = 80 Marks)** | | | | |
| 1. | a. | Explain the following :   1. Storage Schemes. 2. Weak and Strong formulations. | CO1 | 8 |
| b. | Determine the central deflection of a simply supported beam loaded at the centre with a concentrated load ‘P’ and of length ‘l’ using Rayleigh Ritz method. | CO1 | 8 |
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| 2. | a. | Compile the global stiffness matrix for two dimensional truss element. | CO2 | 8 |
| b. | Evaluate the strain-displacement relation matrix B for the triangular element and explain how stiffness matrix is obtained using scalar variable problems for triangular element. The x, y coordinates of node i, j and k are given by (0, 0), (3, 0) and (1.5, 4) mm respectively. Evaluate the shape function N1, N2, N3  at the interior point of the element P (2, 2.5) mm. | CO3 | 8 |
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| 3. | a. | Derive the shape function for four noded isoparametric quadrilateral element as shown in the Fig.1  ɳ  (-1,1)  (1,1)  ɛ  (1,-1)  (-1,-1)  Fig. 1 | CO3 | 12 |
| b. | Enumerate the properties of finite element belonging to serendipity and hermitian families. | CO3 | 4 |
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| 4. | a. | Develop the shape function for a linear 10 noded tetrahedron element using volume coordinates and hence derive its stiffness matrix. | CO3 | 10 |
| b. | Differentiate between Sub, Iso and Superparametric element and explain the importance of Jacobian determinant. | CO4 | 6 |
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| 5. | a. | Describe the triangular plate element. | CO4 | 12 |
| b. | Distinguish Faceted elements from degenerated shell elements. | CO5 | 4 |
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| 6. | a. | What are the plane stress and plane strain problems? Give examples. | CO3 | 6 |
| b. | Discuss the static condensation technique applied for analysis of two dimensional problems. | CO4 | 10 |
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| 7. | a. | Evaluate the following integral using appropriate Gauss Quadrature | CO4 | 12 |
| b. | Differentiate between displacement and stress models available for analysis of structures. | CO1 | 4 |
| **COMPULSORY QUESTION (1 x 20 = 20 Marks)** | | | | |
| 8. | a. | Discuss on auto and adaptive mesh generation technique. | CO6 | 8 |
| b. | Investigate on different softwares available for Finite element analysis. | CO6 | 12 |