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



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

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| **Code :** | **18CE3011** | **Duration :** | **3hrs** |
| **Sub. Name :** | **ADVANCED SOLID MECHANICS** | **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. | The state of stress at a point is given by MPa.  Calculate the principal stresses and their planes. | CO1 | 10 |
| b. | Derive the equations of equilibrium in three dimension using Cartesian coordinates. | CO1 | 6 |
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| 2. | a. | Compare plane stress and plane strain problems with relevant changes in equilibrium equations, strain-displacement relations, stress-strain relations and strain compatibility equations. | CO2 | 8 |
| b. | Prove that the given function is an Airy’s stress function and examine the stress distribution represented by them.  Apply the region bounded by y = 0, y = d, x = 0 towards positive direction. | CO2 | 8 |
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| 3. | a. | State three dimensional equations of equilibrium in polar coordinates. | CO3 | 4 |
| b. | Derive the expressions of radial, circumferential and axial stresses for a thick cylinder having internal and external diameter a, b and internal and external pressure Pi, Pe. | CO3 | 12 |
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| 4. | a. | Derive the expressions for the torque and angle of twist for an elliptical shaft whose major axis is ‘2a’ and minor axis is ‘2b’. | CO4 | 10 |
| b. | Derive an expression for torsion of thin walled sections. |  | 6 |
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| 5. |  | Illustrate the different types of elastic foundations with appropriate examples. Derive the expressions for deflections. | CO5 | 16 |
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| 6. |  | The state of strain at a point about x, y, z coordinates is given by MPa. If x, y, z axis are rotated about z axis through 30o, find the state of strain in the new coordinate system, principal stress and check the invariants. | CO1 | 16 |
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| 7. |  | A two-cell tubular section as formed by a conventional airfoil shape and having one interior web is shown in the figure given. An external torque of 10000 Nm is acting in clockwise direction. Determine the internal shear flow distribution. The cell areas are as follows:  A1 = 680 cm2  A2 = 2000 cm2  The peripheral lengths are also mentioned in the figure. | CO4 | 16 |
| **COMPULSORY QUESTION (1 x 20 = 20 Marks)** | | | | |
| 8. | a. | Discuss the various yield criteria and their significance. | CO6 | 10 |
| b. | Explain the elasto plastic bonding of beams with diagrams. | CO6 | 10 |