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



**End Semester Examination – Nov/Dec – 2017**

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| **Code :** | **17ME3004** | **Duration :** | **3hrs** |
| **Sub. Name :** | **ADVANCED STRENGTH OF MATERIALS** | **Max. marks :** | **100** |

**ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | At a point in a continuum, the stress components are  X = -13y; Y = 0; Z = 0  State whether the equilibrium conditions are satisfied for this state of stress and body force. | CO1 | 10 |
| b. | The state of stress at a point with respect to the xyz system isMpa. Determine the stress tensor relative to the x`y`z` coordinate system obtained by a rotation through 30 degree about z-axis. | CO1 | 10 |
| (OR) | | | | |
| 2. | a. | Explain the importance of strain rosettes. | CO1 | 8 |
| b. | Following unit elongation were measured with a rectangular rosette: . Determine the principal strains and their directions. | CO1 | 12 |
|  |  |  |  |  |
| 3. | a. | For a thin plate with no body forces,  . What are the relations between the constants such that both equations of equilibrium and compatibility are satisfied. | CO2 | 12 |
|  | b. | What is Airy’s Stress function? Why is it called a stress function. | CO2 | 8 |
| (OR) | | | | |
| 4. | a. | Write short notes on stress strain relations for a cylindrical shaped object. | CO2 | 8 |
|  | b. | Investigate whether the function is a stress function. | CO2 | 12 |
|  |  |  |  |  |
| 5. | a. | Determine the maximum shear stress on the outer surface of a closed thin walled circular cylinder internally pressurized at 7MPa. The mean diameter of the cylinder is 500 mm and the wall thickness is 12 mm. | CO3 | 10 |
|  | b. | Explain maximum principal stress theory. | CO3 | 10 |
| (OR) | | | | |
| 6. | a. | Estimate the torque on a 10 mm diameter steel shaft when yielding begins using i) Tresca theory ii) Von mises theory . The yield strength of the steel is 140 MPa. | CO3 | 10 |
|  | b. | Explain Octahedral shearing stress theory. | CO3 | 10 |
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| 7. | a. | Sketch the shear flow due to torsion for various cross sectional shapes. | CO4 | 10 |
|  | b. | Estimate the shear stress and total angle of twist of the thin walled circular cylinder as shown. The steel tube is 0.5 m long and is transmitting a torque of 1 kN.m. The material constants are E = 200 Gpa and = 0.29 | CO4 | 10 |
| (OR) | | | | |
| 8. |  | Consider the equilateral cross section with sides of length a shown in figure. Determine the shear stress distribution if the section is transmitting a torque T. | CO5 | 20 |
|  | | **Compulsory**: |  |  |
| 9. | a. | State and explain the theorem of minimum potential energy. | CO6 | 10 |
|  | b. | State and explain Castigliano’s first theorem. | CO6 | 10 |

ALL THE BEST