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



**End Semester Examination – Nov/Dec – 2018**

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| **Code :** | **18ME3049** | **Duration :** | **3hrs** |
| **Sub. Name :** | **ADVANCED STRENGTH OF MATERIALS** | **Max. marks :** | **100** |

**ANSWER ANY FIVE QUESTIONS (5 x 16 = 80 Marks)**

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | The strain matrix at a particular point in a structure is  Determine the stress matrix if young's modulus = 70 GPa and poisson’s ratio = 0.33. | CO1 | 8 |
| b. | The stress at a point in a body is  Determine the normal strains in x,y and z directions if young's modulus is 10 MPa and poisson's ratio is 0.3. | CO1 | 8 |
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| 2. | a. | Determine the stress fields that arise from the below stress functions. | CO5 | 10 |
| b. | Write short notes on conversion between plane stress and plane strain problems. | CO5 | 6 |
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| 3. | a. | A thin walled cylindrical pressure vessel is made of a ductile material with a yield strength of 53 kPa. The vessel has an outer diameter of 3 m and a wall thickness 10 cm. Estimate the maximum internal pressure which the vessel can withstand before yielding occurs. | CO2 | 6 |
| b. | Determine the maximum Tresca and Von misses stresses for the given stress matrix. | CO2 | 10 |
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| 4. | a. | A rectangular bar with a cross section 25 mm X 50 mm is 500 mm long. Evaluate the maximum shear stress and the total angle of twist if a torque of 600 Nm is transmitted through the shaft. Let young's modulus is 200 GPa and poisson's ratio is 0.3. | CO4 | 8 |
| b. | A solid circular shaft of radius r0 is transmitting a torque T. Determine the corresponding shear stress distribution. | CO4 | 8 |
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| 5. | a. | At a point the state of stress is given by  Determine the strain energy per unit volume if young's modulus is 70 GPa and poisson's ratio is 0.33. | CO6 | 12 |
| b. | Recall Castigilianos first and second theorem. | CO6 | 4 |
| 6. | a. | A point is undergoing the plane stress and relative to the xyz system.  If the plane is rotated to -30 degree about z axis, evaluate the stress components with respect to new system. | CO1 | 8 |
| b. | The state of stress at a point in a body relative to the xyz coordinate system is given by  Determine the stress matrix relative to coordinate system defined by first rotating the xyz coordinate system 45 degree about the x-axis then rotating -45 degree about the new z axis. | CO1 | 8 |
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| 7. | a. | For the stress matrix given below, determine the principal stresses and the directional cosines associated with the normals to the surfaces of each principal stress. | CO1 | 8 |
| b. | The state of stress at a particular point relative to the xyz coordinate system is given by the stress matrix  Determine the normal stress and the magnitude and direction of the shear stress on a surface intersecting the point and parallel to the plane given by the equation 2x - y + 3z = 9. | CO1 | 8 |
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| **COMPULSORY QUESTION (1 x 20 = 20 Marks)** | | | | |
| 8. | a. | Determine the maximum tensile and compressive stresses in the beam shown. | CO3 | 10 |
| b. | Evaluate the shear force and bending moment equations and plot the results. | CO3 | 10 |