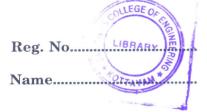
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# **B.TECH. DEGREE EXAMINATION, NOVEMBER 2014**

## Fifth Semester

Branch: Production Engineering / Mechanical Engineering

ME 010 503 / PE 010 503 – ADVANCED MECHANICS OF MATERIALS (ME, PE)

(New Scheme – 2010 Admission onwards)

[Regular/Improvement/Supplementary]

Time: Three Hours

Maximum: 100 Marks

### Part A

Answer all questions.

Each question carries 3 marks.

- 1. Define the term state of stress at a point.
- 2. Explain cantilever beam.
- 3. What are the stresses in thick cylinder under axisymmetric load?
- 4. Write a short note on complementary energy.
- 5. Write a short note on shear flow

 $(5 \times 3 = 15 \text{ marks})$ 

## Part B

Answer all questions.

Each question carries 5 marks.

- 6. Explain the analogy between stress and strain tensors.
- 7. Explain Saint Venant's principle for end effects.
- 8. Explain Interference fit.
- 9. Explain Castigliano's first and second theorems.
- 10. Explain Prandtle's Method.

 $(5 \times 5 = 25 \text{ marks})$ 

#### Part C

Answer all questions.

Each question carries 12 marks.

11. The state of stress at a point is characterized by the following rectangular stress components,  $\sigma_x = 30$ ,  $\sigma_y = 20$ ,  $\sigma_z = 15$ ,  $\tau_{xy} = -10$ ,  $\tau_{yz} = -15$ ,  $\tau_{zx} = -20$ . Find the values of principal stress and their directions.

Or

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- 12. A mild steel bar of 50 mm diameter is subjected to an axial load of 100 KN. Calculate the normal and shear stresses on a plane making an angle of 30° with the direction of applied load.
- 13. Explain compatibility conditions.

Or

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- 14. An alloy steel cylinder has a 100 mm internal diameter and 400 mm outside diameter. If it is subjected to an internal pressure of 150 MPa, (Outside pressure = 0). Determine the radial and tangential stress distribution and plot them.
- 15. A thin steel ring of diameter 1.5 m diameter has elastic limit tensile stress of the material as 250 MN/m<sup>2</sup>. Find the speed at which the thin steel ring will fail. Take  $\rho = 8000$  Kg/m<sup>3</sup>.

Or

- 16. How will you use theories of failure for thick cylinders? Explain with neat sketches.
- 17. Explain the special cases of a body subjected to shear force, bending moment and torque.

Or

- 18. Explain Maxwell reciprocal theorem and Strain energy deformation.
- 19. Derive the expression for torsion in a rectangular shaped shaft.

Or

20. Derive the expression for torsion of thin walled open and closed sections.

 $(5 \times 12 = 60 \text{ marks})$ 

