F 3640 (Pages : 2) Reg. No.....

Name.....

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 × 3 = 15 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 × 5 = 25 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

Turn over

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

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^2. Find the speed at which the thin steel ring will fail. Take ρ = 8000 Kg/m^3.

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 × 12 = 60 marks)