Reg. No._____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

THIRD SEMESTER B.TECH DEGREE EXAMINATION, JANUARY 2017

Course Code**: CE201**

Course Name**: MECHANICS OF SOLIDS (CE)**

Max. Marks: 100 Duration: 3 Hours

PART A

(Answer any two questions)

1. (a) Draw and explain the stress strain diagram for mild steel (7.5)
   (b) Derive the expression for elongation of a tapering circular section subjected to axial load (7.5)
2. Derive all the relations between elastic constants (15)
3. (a) A copper rod 25 mm in diameter is encased in a steel tube 30 mm internal diameter and 35 mm external diameter. The ends are rigidly attached. The composite bar is 500 mm long and is subjected to an axial pull of 30 kN. Find the stresses induced in the rod and the tube. Take E for steel as 2×10^5 N/mm^2 and E for copper as 1×10^5 N/mm^2. (10)

   (b) The rails of a railway line is laid so that there is no stress in the rails at 10 ^{o}C. Calculate the stress in the rails at 60 ^{o}C if there is an expansion allowance of 10 mm per rail. (5)

PART B

(Answer any two questions)

4. (a) Draw the BMD and SFD for a cantilever beam subjected to central concentrated load. (7.5)

   (b) Draw the BMD and SFD for a simply supported beam with udl over entire span. (7.5)

5. (a) A rectangular timber joist of 6 m span has to carry a load of 15 kN/m. Find the dimensions of the joist if the maximum permissible stress is limited to 8 N/mm^2. The depth of the joist has to be twice the width. (7.5)

(b) A 300 mm x 160 mm rolled steel joist of I section has flanges 11 mm thick and web 8 mm thick. Find the safe uniformly distributed load that the section will carry over a span of 5 m if the permissible stress is limited to 120 N/mm^2. (7.5)

6. Derive the expression for shearing stress in a beam section stating the assumptions made (15)

PART C

(Answer any two questions)

7. (a) Explain principal planes and principal stresses (5)
   (b) A point is subjected to a tensile stress of 60 N/mm^2 and a compressive stress of 40 N/mm^2, acting on two mutually perpendicular planes. A shear stress of 10 N/mm^2 is also acting on these planes. Determine the principal stresses and the maximum shear stress. (15)
8. Select a suitable diameter of a solid shaft of circular section to transmit 112.5 kW of power at 200 r.p.m., if the allowable shear stress is 75 N/mm^2 and the allowable twist is 1^o in a length of 3 m. Take G as 0.82 x 10^5 N/mm^2. (20)
9. (a) What are the assumptions in Euler's column theory. (5)

   (b) Write the equations for Euler's crippling load for columns with both ends hinged, both ends fixed, one end fixed and the other hinged, one end fixed and the other free. (5)

   (c) A hollow alloy tube 5 m long with diameters 40 mm and 25 mm was found to extent 6.4 mm under a tensile load of 60 kN. Find the buckling load for the tube when used as a strut with both ends pinned. (10)