Registration No : | | | | | | | | | | |

Total Number of Pages : 02 **B.Tech**
PME3I101

3rd Semester Back Examination 2019-20
MECHANICS OF SOLID
BRANCH : MECH
Max Marks : 100
Time : 3 Hours
Q.CODE : HB533

Answer Question No.1 (Part-1) which is compulsory, any EIGHT from Part-II and any TWO from Part-III.
The figures in the right hand margin indicate marks.

Part- I

Q1 **Only Short Answer Type Questions (Answer All-10)** **(2 x 10)**

a) State Hooke's law.
b) What do you mean by thermal stresses?
c) Express the relationship between SF and BM.
d) What is the shear stress distribution of a circular section?
e) How do you locate the point of maximum bending moment?
f) What do you mean by shear stress in beams?
g) Write any two assumptions in the theory of simple bending.
h) Write the maximum value of deflection for a cantilever beam of length L, constant EI and carrying concentrated load W at the free end.
i) Write down any two assumptions in Euler's column theory.
j) Write torsional equation.

Part- II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 x 8)**

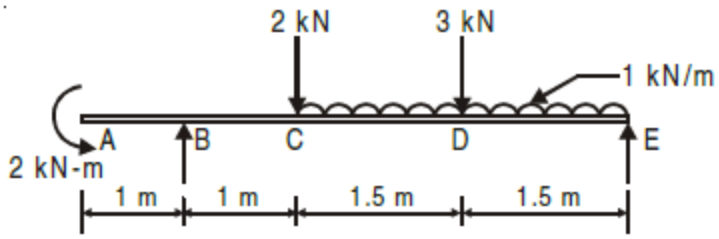
a) Draw and explain the stress-strain diagram for a mild steel material.
b) Obtain a relation for change in length of a bar hanging freely under its own weight.
c) A steel rod 20 mm diameter and 4 m long is connected to two grips and the rod is maintained at a temperature of 30ºC. Determine the stress and pull exerted when the temperature increases to 60ºC If the ends do not yield.
d) A bar of 15 mm diameter is subjected to a pull of 50kN. The measured extension on gauge length of 150 mm is 0.08 mm and the change in diameter is 0.025 mm. Calculate the value of Poisson's ratio and the three moduli.
e) Draw the SFD and BMD for a cantilever beam subjected to central concentrated load.
f) Explain the theorem for conjugate beam method.
g) Derive equation for pure bending with usual notations.
h) Demonstrate Moment area method with an example.
i) Show that maximum shear stress in a beam of rectangular section is 1.5 $q_{average}$.
j) Derive an expression for strain energy stored in a body due to torsion.
k) Distinguish between flexural rigidity and torsional rigidity.
l) Derive the Euler's buckling load for a column with both ends hinged.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 The normal stress in the two mutually perpendicular directions are 500 N/mm^2 and 250 N/mm^2 both tensile. The complementary shear stresses in these directions are of intensity 400 N/mm^2. Find the normal and tangential stresses on the two planes which are equally inclined to the plane carrying the normal stresses. **(16)**

Q4 Draw the shear force and bending moment diagram for the beam as shown below. **(16)**



Q5 A beam of length 15 m is simply supported at its ends and carries two point loads of 100 kN and 50 kN at a distance of 5 m and 10 m, respectively from the left support. Find **(16)**

a) Deflection under each load
b) Maximum deflection
c) The point at which the maximum deflection occurs.

Take I=80×10^{6}mm^4, E = 2×10^5 N/mm^2

Q6 **a)** Derive the torsion equation for a circular shaft of diameter ‘d’ subjected to torque ‘T’. **(8)**

b) Find the torque that can be transmitted by a thin tube 80 mm mean diameter and wall thickness 4 mm. The permissible shear stress is 80 MPa. **(8)**