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

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

PCI3I001

3rd Semester Back Examination 2019-20

MECHANICS OF SOLID

BRANCH : CIVIL

Max Marks : 100

Time : 3 Hours

Q.CODE : HB525

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) Define factor of safety.

c) Express the relationship between SF and BM.

d) What is the shear stress distribution of a rectangular section?

e) Write the differential relation between bending moment, shear force and the applied load.

f) Sketch the shear stress variation for symmetrical I section.

g) Write any two assumptions in the theory of simple bending.

h) State two methods for finding out the slope and deflection at a section.

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 35 mm diameter is subjected to a pull of 65kN. The measured extension on gauge length of 190 mm is 0.075 mm and the change in diameter is 0.028 mm. Calculate the value of Poisson's ratio and the three moduli.

e) Draw the SFD and BMD for a cantilever beam subjected to concentrated load at free end.

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.

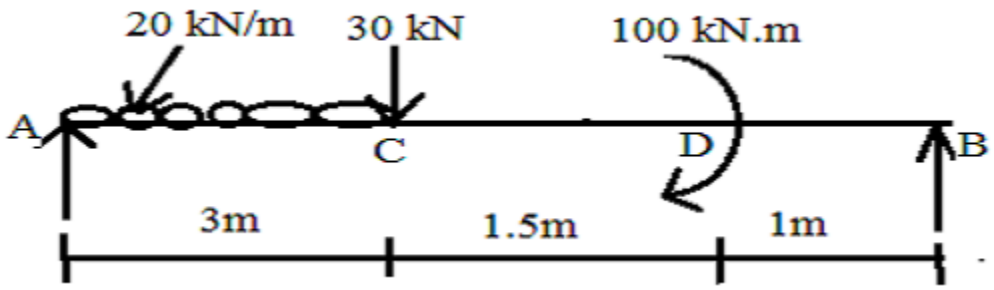
l) Derive the Euler's buckling load for a column with one end fixed and other hinged.

Part-III

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

Q3 A rod ABC consisting of two cylindrical portions AB (length, l=250 mm, diameter, d=30 mm) and BC (length, l=300 mm, diameter, d=50 mm) is restrained at both ends. Portion AB is made of steel (E_s=200GPa, α_s=11.7×10^{-6}/^{0}C) and portion BC is made of brass (E_b=105 GPa, α_b=20.9×10^{-6}/^{0}C). Knowing that the rod is initially unstressed, determine the compressive force induced in ABC when there is a temperature rise of 50^{0}C. **(16)**

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



Q5 A beam of length 20 m is simply supported at its ends and carries two point loads of 80 kN and 40 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 60 mm mean diameter and wall thickness 3 mm. The permissible shear stress is 60 MPa. **(8)**