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

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

PCME4202

3rd Semester Back Examination 2019-20

MECHANICS OF SOLIDS

BRANCH : AUTO, CIVIL, MECH, METTA, MINERAL, MINING, MME

Max Marks : 70

Time : 3 Hours

Q.CODE : HB938

Answer Question No.1 which is compulsory and any FIVE from the rest.

The figures in the right hand margin indicate marks.

Q1 **Answer the following questions :** **(2 x 10)**

a) What do you mean by principle of super position?

b) Define the term limit of proportionality elastic limit and yield point.

c) Give the expression for major principal stress in a two dimensional system.

d) What is shear force in a beam?

e) What is the maximum bending moment for a simply supported beam subjected to uniformly distributed load and where it occurs?

f) What is the slope at the support for a simply supported beam of length L, constant EI and carrying a central concentrated load?

g) Why hollow circular shafts are preferred when compared to solid circular shafts?

h) What is the value of maximum shear stress in a close coiled helical spring subjected to an axial force?

i) Write the expression for power transmitted by a shaft.

j) Define Slenderness ratio.

Q2 **a)** Summarize the procedure for finding the thermal stresses in a composite bar? **(5)**

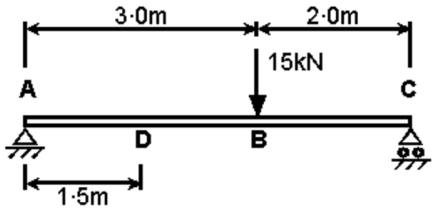
b) A reinforced concrete column is 200mm x 200mm in section. The column is provided with 10 bars each of 20mm diameter. The column carries a load of 400 kN. Calculate the stresses in concrete and the steel bars. Take E_s=200 GPa and E_c=15GPa **(5)**

Q3 **a)** Derive equation for pure bending with usual notations. **(5)**

b) A cantilever beam of 4 m long carries a uniformly distributed load of 2kN/m over a length of 2 m from the fixed end and 3kN at free end. Draws shear force and bending moment diagrams for the beam. **(5)**

Q4 **a)** Formulate the slope at the support for a simply supported beam of length L, constant EI and carrying central concentrated load. **(5)**

b) For the beam shown in figure, determine the deflection at the B. **(5)**



Q5 **a)** Derive the torsional equation with usual notations. **(5)**

b) A solid circular shaft transmits 70kW power at 200rpm. Estimate the values of shaft diameter, if the twist in the shaft is not to exceed one degree in 2m length of shaft and shear stress is not exceed 60 N/mm^2. Assume the modulus of rigidity of the material of the shaft as 100 kN/mm^2. **(5)**

Q6 An elemental cube is subjected to tensile stresses of 40 N/mm^2 and 20 N/mm^2 acting on two mutually perpendicular planes and a shear stress of 20N/mm^2 on these planes. Draw the Mohr's circle of stresses and determine the magnitudes and direction of principal stresses and also the maximum shear stress. **(10)**

Q7 A close coiled helical spring has a stiffness of 5N/mm. its length when fully compressed with adjacent coils touching each other is 400 mm. the modulus of rigidity of the material of the spring is 8×10^4 N/mm^2. Determine the wire diameter and mean coil diameter if their ratio is 1/10. What is the corresponding maximum shear stress in the spring? **(10)**

Q8 **Write short answer on any TWO :** **(5 x 2)**

a) St. Venant's Principle

b) Euler's column theory

c) Area - Moment method