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

Total Number of Pages : 02 **B.Tech**
PCI3I001

3rd Semester Regular / Back Examination 2018-19
MECHANICS OF SOLID
BRANCH : CIVIL
Time : 3 Hours
Max Marks : 100
Q.CODE : E658

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

a) What is proof stress?
b) Explain the Principle of Superposition.
c) What is Poisson's ratio?
d) Define Bulk Modulus.
e) What is polar moment of inertia?
f) What is Principal strain?
g) What is point of contraflexure?
h) What is composite beam? What is its utility?
i) What is slenderness ratio?
j) What do you mean by volumetric strain?

Part- II

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

a) Define shear stress and explain the principle of shear stress.
b) Draw the stress-strain diagram for mild steel and mention the important points.
c) Derive the expression for volumetric strain of a thin spherical vessel subjected to internal pressure.
d) Explain what you understand by 'beam of uniform strength', and how can it can be achieved?
e) Draw the Mohr's circle for two perpendicular stress (one is tensile and another is compressive).
f) What is flitched beam and what are its advantages?
g) Drive the equation of equivalent twisting moment and equivalent bending moment of a shaft subjected to bending moment M and torsion T.
h) Compare the weight ratio of hollow shaft and solid shaft subjected to turning moment 'T'.
i) What is the Strain energy of a hollow shaft subjected to torsion 'T'?
j) What is Euler's formula? Explain the limitation of it.
k) Derive an expression for the stiffness of closely-coiled helical spring subjected to axial load.
l) Describe the types of load and types of support in beam subjected to transverse loads.

Part-III

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

Q3 **a)** Establish the relation between Young's modulus (E), modulus of rigidity (G) and bulk modulus (K). **(12)**

b) How the thermal stresses developed in composite rods? Explain **(4)**

Q4 **a)** A rectangular beam 300 mm deep is simple supported over a span of 4 meters. What UDL per meter the beam may carry, if the allowable bending stress is 120 N/mm^2? (Take I= 8 x $10^6 mm^4$) **(10)**

b) Explain the distribution of shear stress of a circular cross section beam subjected to transverse load W. **(6)**

Q5 **a)** Derive an expression for crippling load for the column, when both of the ends are hinged. **(8)**

b) Determine the expression for maximum slope and deflection of cantilever beam carrying a concentrated load 'W' at its free end. **(8)**

Q6 **a)** A helical spring is made of 6 mm diameter steel wire. The mean diameter of the coil is 12 cm and there are 20 effective turns in it. Find the load that causes a deflection of 25 mm. If the same load is dropped from height of 10 cm on the spring find the deflection and maximum stress induced in the spring. (Take G_s=80 Gpa) **(8)**

b) A hollow shaft of diameter ratio 3/8 is required to transmit 600 kW at 110 rpm, the maximum torque being 20 % greater than the mean. The shear stress is not exceed to 63 MN/m^2. And angle of twist in length of 3 meters not to exceed 1.4^0. Calculate the required external diameter of shaft. **(8)**