16/11/19

ARKA JAIN University, Jharkhand

3rd Semester Final Examination – 2019-20

ME

Subject: SOM/MOS
Branch – Mechanical Engg./Civil Engg
Time: 3 Hours

Course: B.Tech.
Full Marks: 70
Pass Marks: 28

- Candidates are required to give their answers in their own words as far as practicable.
- Question paper is divided in to **Three Parts-A, B & C.**
- **Part -A** is compulsory.
- **Part- B** contains **SIX** question out which **FOUR** are to be Answered.
- **Part- C** Contains **SIX** question out of which **THREE** is to be Answered.

PART A

Q1) Multiple Choice Questions **(10x1=10)**

i) The shear force and bending moment are zero at the free end of a cantilever beam, if it carries a
a) point load at the free end
b) point load at the middle of its length
c) uniformly distributed load over the whole length
d) none of the above

ii) What is stress?
a) The ratio of change in length to the original length
b) The ratio of original length to the change in length
c) The ratio of force to the cross-sectional Area
d) The ratio of change in length to the tensile force applied

iii) Hookes law states that
a) The normal stress is directly proportional to corresponding strain
b) The relation between shear stress and the corresponding strain
c) The relation between lateral strain and the corresponding stress
d) None of the mentioned

iv) The unit of modulus of elasticity is same as those of
a) stress, strain and pressure
b) stress, force and modulus of rigidity
c) strain, force and pressure
d) stress, pressure and modulus of rigidity

v) The torque transmitted by a hollow shaft of outer diameter (D) and inner diameter (d) is
a) $\frac{\pi}{4} \times \tau \left(\frac{D^2 - d^2}{D} \right)$
b) $\frac{\pi}{16} \times \tau \left(\frac{D^3 - d^3}{D} \right)$
c) $\frac{\pi}{16} \times \tau \left(\frac{D^4 - d^4}{D} \right)$
d) $\frac{\pi}{32} \times \tau \left(\frac{D^4 - d^4}{D} \right)$

vi) When a shaft, is subjected to torsion, the shear stress induced in the shaft varies from
a) minimum at the centre to maximum at the circumference
b) maximum at the centre to minimum at the circumference
c) zero at the centre to maximum at the circumference
d) maximum at the centre to zero at the circumference

vii) The bending moment of a cantilever beam of length l and carrying a uniformly distributed load of w per unit length is _____ at the fixed end.

a) wl/4
b) wl/2
c) wl
d) wl2/2

viii) Young's modulus is defined as the ratio of

a) Volumetric stress and volumetric strain
b) Lateral stress and lateral strain
c) Longitudinal stress and longitudinal strain
d) Shear stress to shear strain

ix) In a loaded beam, the point of con-traflexture occurs at a section where

a) bending moment is minimum
b) bending moment is zero or changes sign
c) shearing force is maximum
d) bending moment is maximum

x) The bending moment is maximum on a section where shearing force

a) is minimum
b) equal sign
c) changes sign
d) d) is maximum

B) Very short question

(5x2=10)

a) Define :- a) Poissions Ratio b) Volumetric strain

b) Explain Hook's law with assumption.
c) Write the expression for Power transmitted by the shaft.
d) Define :- a) Thermal stress b) Moment of Inertia

e) Define Slenderness ratio and Point of Contra flexure.

PART B

Q.2) Answer any Four Question **(4x5=20)**

a) Define Shear force and bending moment. Write the relation between rate of loading, shear force and bending moment.

b) Explain the term Moment of inertia (MOI). Write expression of MOI for rectangular, circular, hollow rectangular and hollow circular.

c) Explain Parallel and Perpendicular axes Theorem.

d) Derive the expression for shearing stress over a rectangular section.

e) A simply supported beam 5m long carries a uniformly distributed load of 10KN/m throughout the length. Draw the sheer force and bending moment diagram of the given beam.

f) A circular beam of 100mm diameter is subjected to a shear force of 30KN. Calculate the value of maximum shear stress and sketch the variation of shear stress along the depth of beam.

PART C

Answer any Three Question **(3x10=30)**

Q.3)

a) State and explain Theory of simple bending with Assumption. Write the equation of bending.

b) A steel wire of 5mm diameter is bent in to a circular shape of 5mm radius. Determine the maximum stress induced in the wire. Take E=200GPa

Q.4)

a) State and explain Concept of pure Torsion with Assumption. Write the Torsion equation for solid and hollow circular shaft.

b) A circular shaft of 60mm diameter is running at 150 rpm. If the shear stress is not to exceed 50Mpa, find the power which can be transmitted by the shaft.

Q.5) Draw the Shear force and Bending moment diagram of the given beam.

Q.6) Find the moment of inertia of T-section with flange as 150mmx150mm and web as 150mmx150mm about XX and YY axes through centre of gravity of the section.

Q.7)

a) Define Thermal stress, thermal strain, and Hoop stress.

b) A bar of uniform diameter 40 mm and length 2.5m is subjected to an axial tension of 150 KN . If E= 210 KN/mm^2 and $\mu = 0.3$, Find the Extension of the bar, change in diameter.

Q.8)

a) Define simple stress and strain. Also explain the types of stress and strain.

b) A bar of stepped cross-section is shown in figure. Find the value of P for equilibrium, Take E=1.2 X 10^5 KN/mm^2