PVP 14

Code: ME4T1

II B.Tech - II Semester – Regular/Supplementary Examinations – April 2017

MECHANICS OF SOLIDS - II
(MECHANICAL ENGINEERING)

Duration: 3 hours Max. Marks: 70

PART – A

Answer ***all*** the questions. All questions carry equal marks

11 x 2 = 22

1.

a) Define the term i) Torsion and ii) Torsional rigidity.
b) When the circular shaft is subjected to a torsion show that the shear stress varies linearly from the axis to the surface.
c) Define the term slope and deflection of beams.
d) What is the moment-area method? Where it is conveniently used?
e) Prove the relation that $M = EI (d^2y/dx^2)$.
f) What do you mean by fixed and continuous beams?
g) What is the assumption made in curved beam which are subjected to bending moment?
h) Define slenderness ratio.
i) What are the limitations of the Euler's Formula?
j) Define circumferential and longitudinal stress with reference to thin cylinders.
k) State the assumption made in Lame's theory.

PART – B

Answer any ***THREE*** questions. All questions carry equal marks.

3 x 16 = 48 M

2. a) A solid Aluminum shaft 1 m long and 50 mm diameter is to be replaced by a hollow steel shaft of the same length and same outside diameter, so that the hollow shaft could carry the same torque and has the same angle of twist. What must be the inner diameter of the hollow shaft? Take modulus of rigidity for Aluminum as 28 GPa and for steel 85 GPa. 10 M

b) Derive the expression for strain energy store in pure shear. 6 M

3. a) A cantilever beam of length 2m carries a uniformly varying load of 25kN/m at the free end to 75kN/m at the fixed end. If $E=1x10^5$ N/mm^2 and I = 10^8 mm^4. Determine the slope and deflection of the cantilever at the free end. 10 M

b) Using moment area method, determine the defection at the centre of a simply supported beam subjected to point load at the centres. Assume usual parameters for the beam. 6 M

4. A continuous beam ABCD of length 15m rests on 4-supports covering three equal span and carries a uniformly distributed load of 1.5kN/m length over the

entire span. Calculate the moments and reactions at the supports. Draw the Shear force and bending moment diagrams also. 16 M

5. a) A simply supported beam of length 4 m is subjected to a uniformly distributed load of 30kN/m over the whole span and defects 15mm at the centre. Determine the crippling load when the beam is used as columns with the following conditions. 8 M

i) One end fixed and the other end is hinged

ii) Both end pin jointed

b) With reference to columns, derive Secant formula. 8 M

6. A Compound tube is composed of a tube 250 mm internal diameter and 25 mm thick shrunk on a tube of 250 mm external diameter and 25 mm thick, the radial pressure at the junction is 8 N/mm^2. The compound tube is subjected to an external fluid pressure of 84.5 N/mm^2. Plot the variation of hoop and radial stresses across the thickness. 16 M