PVP 14

Code: ME4T1

II B.Tech - II Semester – Regular/Supplementary Examinations – April 2018

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 terms 'torsional rigidity' and torsional stiffness of a shaft.
b) Write the expression for 'shear stress' produced in a circular shaft which is subjected to torsion.
c) State moment area theorems.
d) Compare Macaulay's method over moment area method for determining deflections of beams.
e) What is the difference between 'straight beam' and 'curved beam'?
f) What is meant by 'crippling load'? Explain.
g) What are the assumptions made in 'Euler's column theory'.
h) What is meant by 'equivalent length of a column'? How is this concept used in column theory?
i) What is the important assumption made in the analysis of 'thick cylinders'?

j) Write the general equations for 'circumferential' and 'radial stresses' developed in thick cylinders.

k) State Clapeyron's theorem of three moments.

PART – B

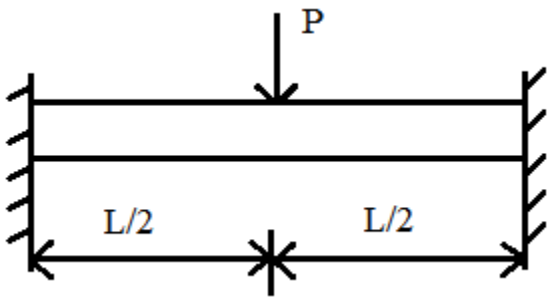
Answer any ***THREE*** questions. All questions carry equal marks.

3 x 16 = 48 M

2. a) Compare the weight of a solid shaft with that of a hollow one to transmit a given power at a given speed with a given Maximum shear stress, the outside diameter of the hollow shaft being 1.5 times the internal diameter. 8 M

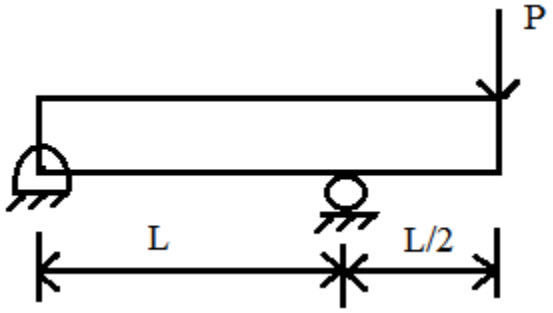
b) Find the diameter of a solid shaft to transmit 115kW of power at 225 rpm, if the shear stress is not to exceed 80 N/mm^2 and twist shall not exceed 1^0 in a length of 3.25 m. Take $C=8\times10^4$ N/mm^2. 8 M

3. a) A beam is loaded and supported as shown in figure, determine the deflection in the middle of the span. Take the flexural rigidity of beam as EI. 10 M

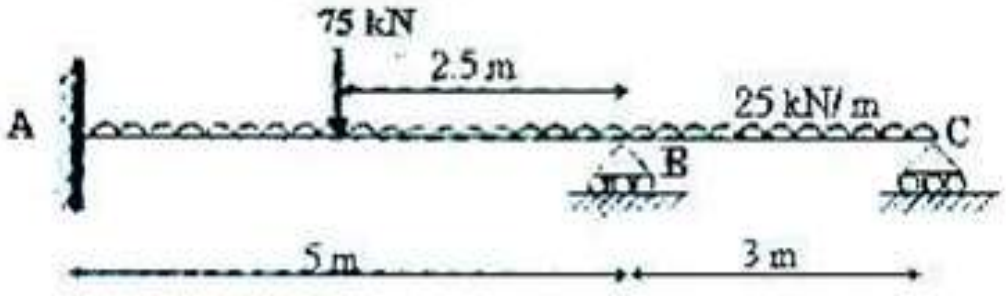


b) For the beam and loading shown in figure, determine (i) the deflection midway between the two supports and (ii) the slope at A. Take the flexural rigidity of the beam as EI.

6 M



4. A continuous beam of uniform cross-section supported and loaded as shown in Figure. Draw the shear force and bending moment diagrams if the supports B and C sink by 25 mm and 10 mm respectively. 16 M



5. a) A hollow cast-iron column whose outside diameter is 260 mm and has a thickness of 20 mm is 5.2 m long and is fixed at both ends. Calculate the safe load by Rankine's formula using a factor of safety of 2.8. Find the ratio of Euler's to Rankine's loads. Take young's modulus as 106 GPa and Rankine's constant as 1/1670 for both ends pinned and the crushing strength of the material as 575 MPa.

12 M

b) State the limitations of Euler's formula. 4 M

6. A compound steel cylinder has a bore of 80 mm and an outside diameter of 160 mm, the diameter at the common surface being 120 mm. Find the radial pressure at the common surface which must be provided by shrinkage if the resultant maximum hoop tension in the inner cylinder under a superimposed internal pressure of 60 N/mm^2 is to be half the value of the maximum hoop tension which would be produced in the inner cylinder if that cylinder alone were subjected to an internal pressure of 60 N/mm^2. Determine the final hoop tensions at the inner and outer surfaces of both cylinders under the internal pressure of 60 N/mm^2 and sketch a graph to show the hoop tension varies across the cylinder wall. 16 M