

Name:

Enrolment No:



UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
Supplementary Examination, Dec. 2023

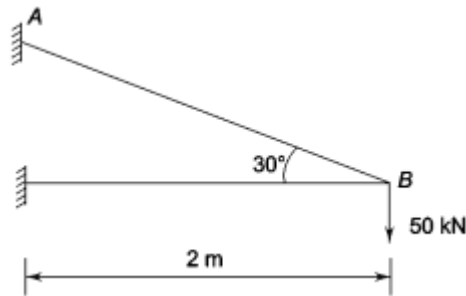
Course: Aircraft Structure-I
Program: B. Tech ASE/ASE-AVE
Course Code: ASEG 3010

Semester: V
Time 03 hrs.
Max. Marks: 100

Instructions: a) All questions are compulsory.
b) Assume any suitable value for the missing data
c) Q1-Q3 are TRUE/FALSE

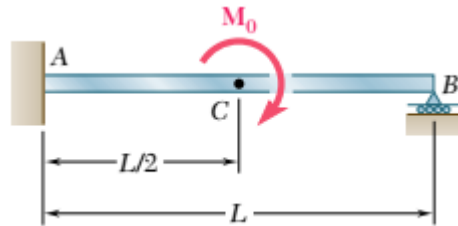
SECTION A

S. No.		Marks	CO
Q 1	a) Two bars with same mass has always same strain energy under load b) Within the proportional limit, strain energy varies linearly with load	4	CO1
Q2.	c) The Change in slope between any two points on the elastic curve equals the area of the M/EI diagram between both endpoints of the beam. d) The method of the section can be applied if the section cuts four members.	4	CO4
Q3.	a) Strain energy method to determine deflection applicable only for all elastic material b) A column is free from both ends, if the column is heated uniformly across length then the column can buckle due to increase in temperature	4	CO3
Q4.	Compare the critical stresses using Euler's and Rankine's formulae for struts with slenderness ratios 50, Assume that both ends are hinged. $E=200$ GPa, Rankine's constant = $1/7500$, and $\sigma_y=300$ MPa	4	CO4
Q5.	Two bars are subjected a load of 20KN as shown in fig. below, determine the vertical If the radius of each members is 25 mm and $E = 200$ GPa. The vertical deflection of point B is	4	CO2



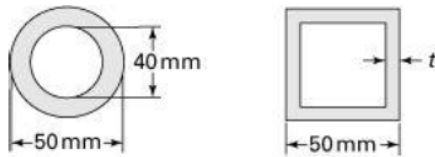
SECTION B

Q 6 For the propped cantilever beam below determine the support reaction if $M_0 = 10 \text{ KNm}$ and draw the shear force and bending moment.



10 CO2

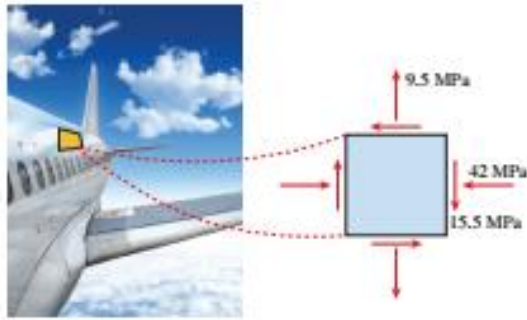
Q7. Figure shows the cross sections of two aluminum alloy 2114-T6 bars that are used as compression members, each with effective length of L . Find (a) the wall thickness the hollow square bar so that the bars have the same cross-sectional area; (b) the critical load of each bar. Given: $L = 3 \text{ m}$ and $E = 72 \text{ GPa}$.



10 CO3

Q8. An element in plane stress on the fuselage of an airplane (figure part a) is subjected to compressive stresses with a magnitude of 42 MPa in the horizontal direction and tensile stresses with a magnitude of 9.5 MPa in the vertical direction (see figure part b). Also, shear stresses with a magnitude of 15.5 MPa act in the directions shown, Determine the stresses acting on an element oriented at a clockwise angle of 40° from the horizontal. Show these stresses on a sketch of an element oriented at this angle.

10 CO3

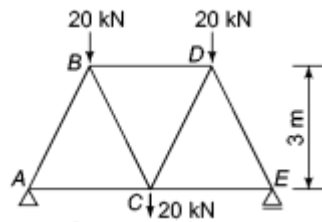


Q9 The load on a bolt consists of an axial pull of 10 kN together with a transverse shear force of 6 kN. Calculate the diameter of the bolt according to
 (a) Maximum principal strain theory
 (b) Shear strain energy theory.
 Take factor of safety as 2, given yield strength of the material = 310 N/mm² and poisson's ratio = 0.27

10 CO4

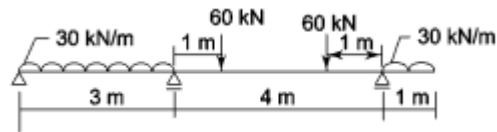
SECTION-C

Q10 Determine the vertical deflection of point C due to the applied load



20 CO2

Q11. Analyze the continuous beam as shown below using and draw the SF and BM diagrams.



OR

Analyse the beam and draw the shear force and bending moment diagram.

20 CO1

