


<b>Name:</b> <b>Enrolment No:</b>	
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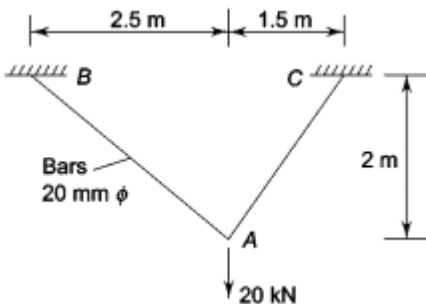
**UNIVERSITY OF PETROLEUM AND ENERGY STUDIES**  
**End Semester Examination, December 2022**

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

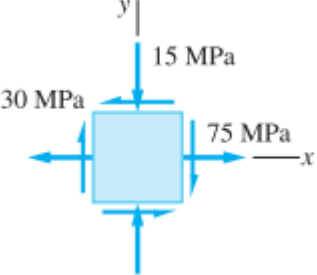
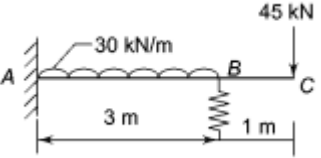
**Semester: V**  
**Time : 03 hrs.**  
**Max. Marks: 100**

**Instructions: Q.1-4 are True/False**  
**Assume any suitable value for the missing data.**

**SECTION A**  
**(5Qx4M=20Marks)**

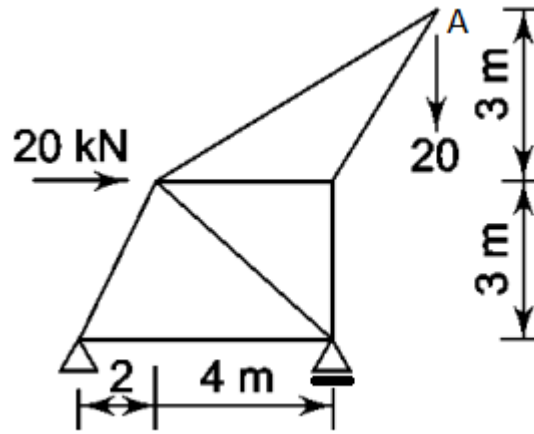
S.no.		Marks	CO
Q. 1	a) For a 2D truss the possible number of static equilibrium equations are 3. b) If the applied torque on the beam is doubled then the strain energy stored in the beam is becomes four times.	4	CO1
Q. 2	a) Column buckles at the highest value of moment of inertia of the cross-section. b) Euler's buckling of column does not provide the value of deflection at any length of the column	4	CO4
Q. 3	a) Strain energy method to determine deflection applicable only for linear 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
Q. 4	Compare the critical stresses using Euler's formulae for struts with slenderness ratios 50, Assume that both ends are fixed. For $E=200$ GPa, and $E = 70$ GPa	4	CO4
Q. 5	In the simple bracket arrangement as shown below is subjected to a 20 kN load acting at point A. The vertical deflection at point A is:  <div style="text-align: center;">  </div>	4	CO2

**SECTION B**  
(4Qx10M= 40 Marks)

Q.6	A 20 mm by 40 mm, 4 m long, is used as a column with fixed end. If $E = 69 \text{ GPa}$ and $\sigma_{pl} = 40 \text{ MPa}$ , determine the largest axial load that can be carried with a factor of safety of 2.5	<b>10</b>	<b>CO4</b>
Q.7	The principal stresses at a point in a ductile material are $\sigma_1 = .5\sigma_0$ , $\sigma_2 = 0.5 \sigma_0$ and $\sigma_3 = 0$ . If the yield strength of the material is 200 MPa, determine the value of $\sigma_0$ that initiates yielding using (a) the maximum shear stress theory; and (b) the maximum distortion energy theory	<b>10</b>	<b>CO4</b>
Q.8	For the state of stress at a point as shown in the fig. below, determine a) Principal stresses b) Maximum shear stress  	<b>10</b>	<b>CO3</b>
Q.9	A cantilever beam is being propped at B. If the stiffness of spring is 2000 N/mm, then find the reaction at the spring. $EI = 60,000 \text{ kNm}^2$  	<b>10</b>	<b>CO2</b>

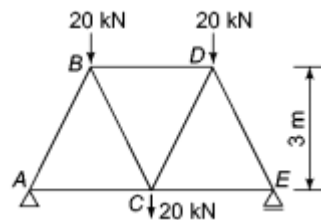
**SECTION-C**  
(2Qx20M=40 Marks)

Q 10.	Determined the vertical displacement of the point A of the truss shown below.	<b>20</b>	<b>CO2</b>
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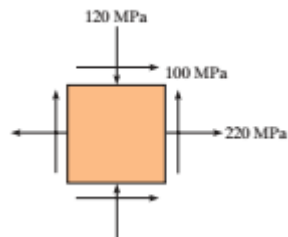
OR

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



Q.11

The components of plane stress at a critical point on an aluminium shell are shown.



- Determine the maximum shear stress
- Determine yield strength if failure (yielding) has occurred on the basis of the maximum distortion-energy theory

20

CO3