Name:

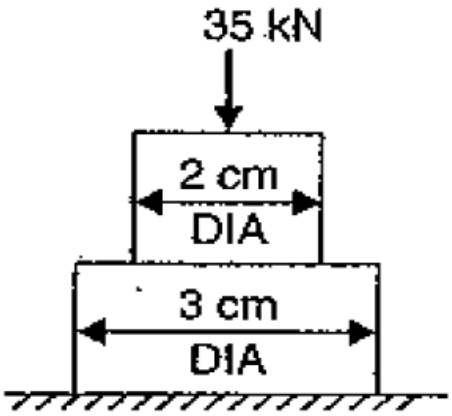
Enrolment No:

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, May 2021

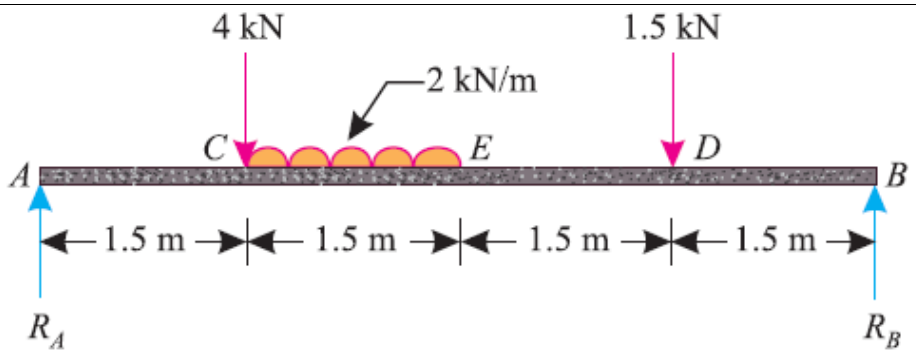
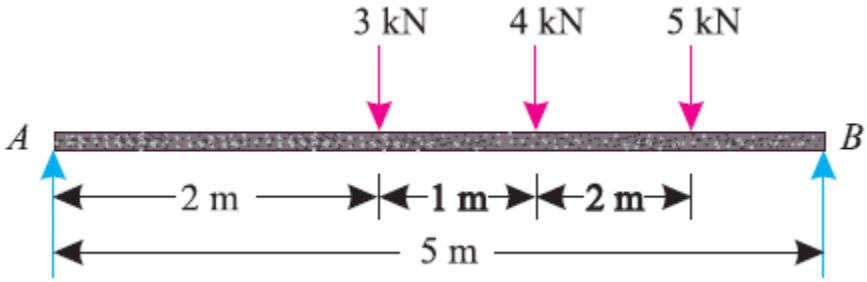
Programme Name: B.Tech/Mechanical and ADE **Semester : IV**
Course Name : Strength of material **Time : 03 hrs**
Course Code : MECH 2012 **Max. Marks : 100**
Nos. of page(s) : 03
Instructions: Attempt all the questions as directed. Assume suitable data if missing.

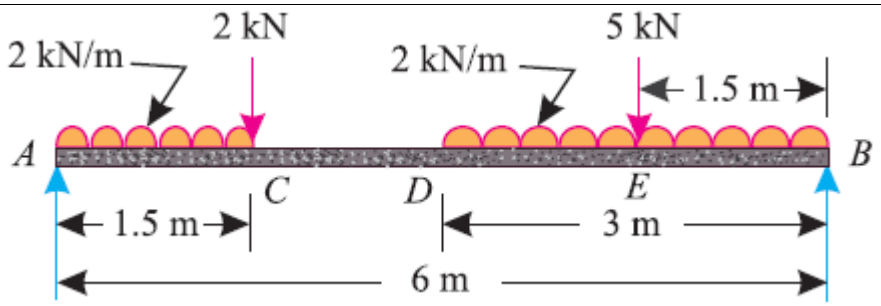
SECTION A

S. No.	Statement	Marks	CO
Q 1	A rod of 150 cm long and diameter 2.0 cm is subjected to an axial pull of 20 KN. If the modulus of elasticity of the material of the rod is 2x 105 N/mm2 Determine 1. Stress 2. Strain 3.the elongation of the rod. Write the annswer only.	**5**	**CO1**
Q 2	A stepped bar as shown in figure is subjected to an axially applied load of 35 kN. Find the ratio of maximum and minimum stresses produced. Write the annswer only. 	**5**	**CO1**
Q 3	Define a composite bar. Also, explain the method of finding the stresses and load carried by each member of a composite bar.	**5**	**CO2**
Q 4	Differentiate between primary shear and secondary shear along with suitable examples.	**5**	**CO2**
Q 5	Enlist the assumption made in deducing equation for simple bending.	**5**	**CO3**
Q 6	Discuss temperature stress.	**5**	**CO1**

SECTION B

Q 7	Draw the shear force and bending moment for the simply supported beam loaded as shown in figure. Also discuss its' salient features.	**10**	**CO2**

			
Q 8	A solid circular shaft transmits 75 kW power at 200 r.p.m. Calculate the shaft diameter, if the twist in shaft is not to exceed 1 degree in 2 m length of the shaft, and shear stress is limited to 50 N/mm^2. Take G=1x 10^{5}N/mm^2.	**10**	**CO3**
Q 9	A closed cylindrical vessel made of steel plates 6 mm thick with plane ends, carries fluid under pressure of 2.5 N/mm^2 The diameter of the cylinder is 30 cm and length is 70 cm. Calculate the longitudinal and hoop stresses in the cylinder wall and determine the change in diameter, length and Volume of the cylinder. Take E =2.1x10^5 N/mm^2 and poison's ratio = 0.3.	**10**	**CO3**
Q 10	Starting with the assumption made in theory of simple bending, derive an expression for the following bending equation with usual notations; $\frac{M}{I} = \frac{\sigma}{y} = \frac{E}{R}$	**10**	**CO2**
Q 11	A simply supported beam of a square cross-section of the dimensions 250 mm x 250 mm is loaded as shown in figure. Find the maximum bending stresses developed in the beam.  OR Compare the bending strength of two shafts of same cross-section area, one is circular and other is square in cross-section.	**10**	**CO2**
SECTION-C			
Q 12	A beam of length 6 m length is loaded as shown in figure. Determine the slop and deflection at point C and D.	**20**	**CO4**



OR

At a point in a bracket, the stress on two mutually perpendicular planes are 100 N/mm^2 (tensile) and 50 N/mm^2 (tensile). The shear stress across the planes is 30 N/mm^2. Find using Mohr stress circle, the magnitude and direction of the resultant stress on plane making an angle of 20^0 with the plane of the first stress. Find also the normal and tangential stresses on this plane. Also, determine the principal stresses and the location of principal planes.