



	InSem Examination-IWinter 2023		
	Exam Seat No.:		
	Academic Year:2023-2024	Semester: III	
	Name of Programme: B.Tech Civil Engineering	Pattern: 2022	
	Name of Course: Mechanics of Structures	Course Code:CIV222002	
	Max. Marks:30	Duration: 1Hr.	

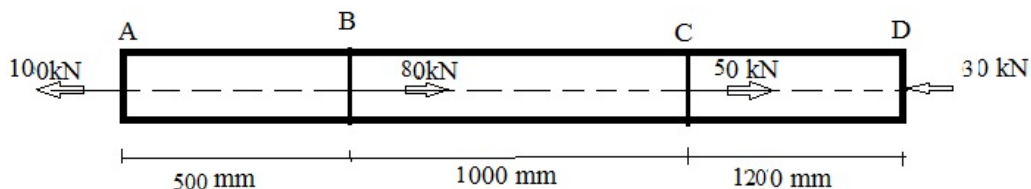
Instructions: Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.

1. This question paper contains 4 pages.
2. Answer to each new question is to be started on a new page.
3. Assume suitable data wherever required, but justify it.
4. Draw the neat labelled diagrams, wherever necessary.
5. The last columns indicates the Course Outcome and level of Blooms Taxonomy of the Question/sub-question

Question No. 1 Attempt following Question

a)

A steel bar of 500 mm^2 cross-sectional area is carrying loads as shown in fig.1a. Determine the elongation of the bar. Take E for the steel as 80 GPa.



(5) CO1

Fig. 1a

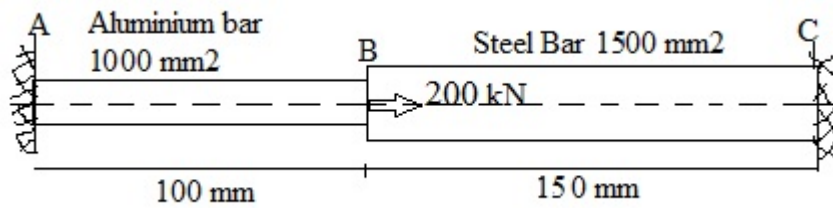
OR

- b) A bar of 30mm diameter is subjected to a pull of 60 kN. The measured extension on a gauge length of 200 mm is 0.09 mm and the change in diameter is 0.0039 mm. calculate the Poissons ratio and the values of the three moduli. (5) CO1

- c) A steel cube block of 50 mm side is subjected to a force of 6 kN (Tension), 8kN (Compression) and 4kN (Tension) along x, y and z direction respectively. (5) CO1
Determine the change in volume of the block. Take E as 200 GPa and μ as 10/3.

OR

- d) A reinforced concrete column is 400 mm x 400mm in section. The column is provided with 8 bars of 16 mm diameter. The column carries a load of 460 kN. Find the stresses in concrete and the steel bars. Take $E_s = 2.1 \times 10^5 \text{ N/mm}^2$ and $E_c = 0.15 \times 10^5 \text{ N/mm}^2$. (5) CO1
- e) A composite bar made up of aluminium and steel is firmly held between the two unyielding supports as shown in fig. 1e and an axial load of 200 kN is applied at point B at 320°C. Take E for aluminium and steel as 70 GPa and 210 GPa respectively. Take coefficient of thermal expansion for aluminium and steel as $24 \times 10^{-6}/^\circ\text{C}$ and $12 \times 10^{-6}/^\circ\text{C}$ respectively. (5) CO1



OR

- f) Fig1 f, shows an assembly of an aluminium shell fully bonded to a steel core and is unstressed. Determine the largest allowable rise in temperature if the stress in aluminium shell is not to exceed 40 N/mm². Find also the corresponding increase in length of the assembly. Take $E_s = 20 \times 10^5 \text{ MPa}$, $E_a = 7.5 \times 10^4 \text{ MPa}$, Coefficient of thermal expansion for steel = $13 \times 10^{-6}/^\circ\text{C}$ and , Coefficient of thermal expansion for aluminium = $23 \times 10^{-6}/^\circ\text{C}$. (5) CO1

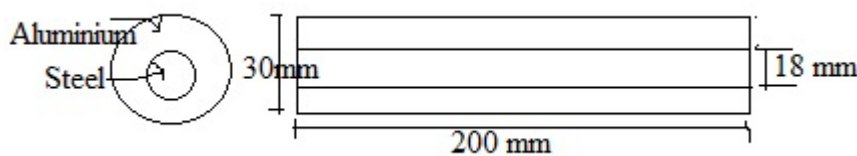


Fig. 1f

Question No. 2 Attempt following Question

- a) A simply supported beam AB of span 3 m is carrying two point loads as shown in fig.2 a. Draw the shear force and bending moment diagrams for the beam. (5) CO2

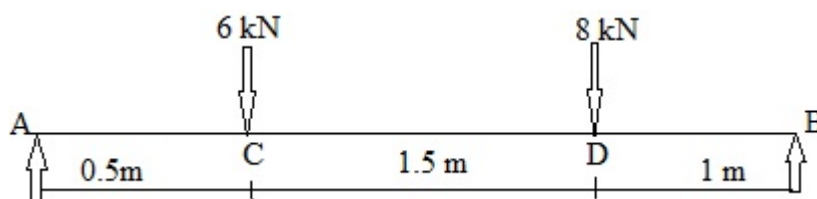
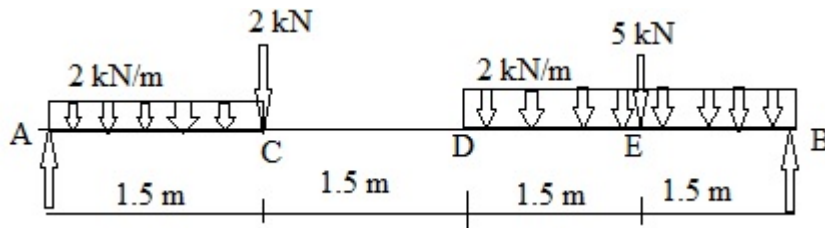


Fig. 2a

OR

b)

A simply supported beam AB of span 6 m is loaded as shown in fig.2 b. Draw the shear force and bending moment diagrams for the beam.

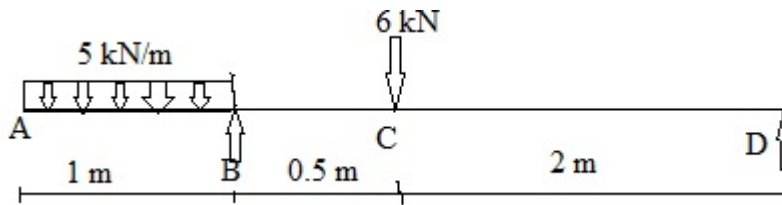


(5) CO2

Fig. 2b

c)

An overhanging beam ABC is loaded as shown in fig.2 c. Draw the shear force and bending moment diagrams for the beam and find the point of contra flexure, if any.



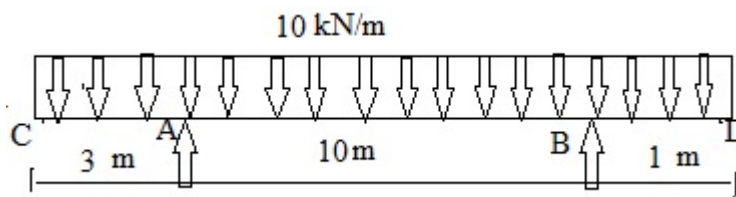
(5) CO2

Fig. 2c

OR

d)

An overhanging beam ABC is loaded as shown in fig.2 d. Draw the shear force and bending moment diagrams for the beam and find the point of contra flexure, if any.

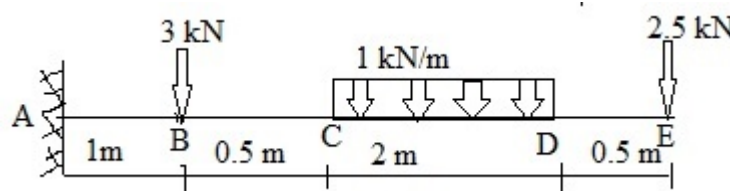


(5) CO2

Fig. 2d

e)

Draw the shear force and bending moment diagrams for the cantilever beam as shown in fig.2 e.



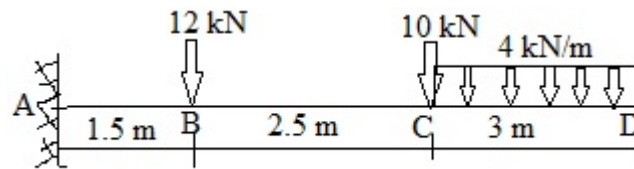
(5) CO2

Fig. 2e

OR

f)

Fig 2 f shows a cantilever subjected to a system of loads. Draw the shear force and bending moment diagrams for the cantilever beam.



(5) CO2

Fig. 2f