VIT
Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)

**SCHOOL OF MECHANICAL ENGINEERING**

**CONTINUOUS ASSESSMENT TEST – II**

**SLOT: C2 + TC2**

**FALL SEMESTER 2022-2023**

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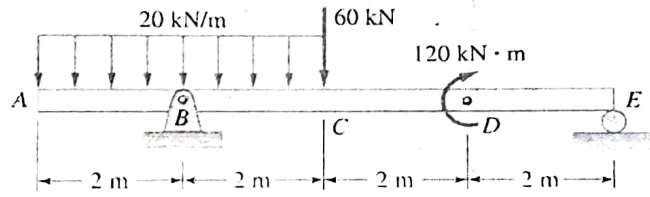
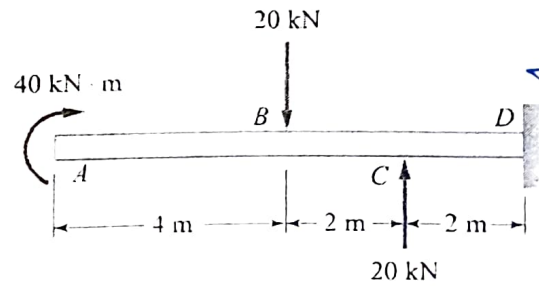
**Programme Name & Branch** : B.Tech & Mechanical
**Course Code** : BMEE202L
**Course Name** : Mechanics of Solids
**Faculty Name(s)** : Dr. Velu M, Dr. Sharan Chandran M, Dr. Arivarasu M, Dr. Rahul Singh Sikarwar, Dr. Akash Mohanty
**Class Number(s)** : VL2022230100573, VL2022230100575, VL2022230100577, VL2022230100579, VL2022230100574

**Duration: 90 min.** **Max. Marks: 50**

**General instruction(s):** Answer, to the point. Tabulate your final results.

| Q. No | Question | Marks |
|---|---|---|
| 1. | Draw the shear force and bending moment diagram for the given loading condition (Fig. 1) of the overhanging beam and mark the point(s) of contraflexure.<br>  <br>Fig. 1 | 10 |
| 2. | Draw the shear force and bending moment diagram for the loading condition (Fig. 2) of the given cantilever beam.<br>  <br>Fig. 2 | 10 |
| 3. | A 90 kg man starts at end A of the wooden plank and walks toward end B (Fig. 3). If the plank will fail when the maximum bending stress is 40 MPa, find the farthest distance ***x*** that the man can walk safely. | 10 |

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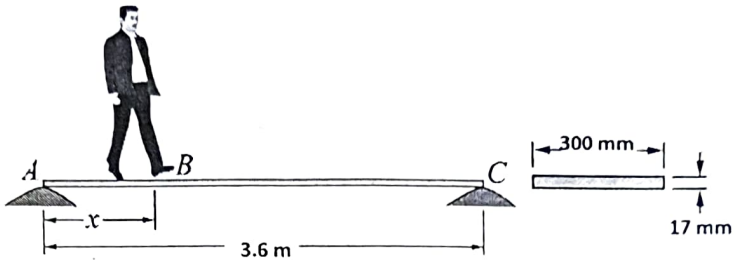


Fig. 3

| | | |
|---|---|---|
| 4. | A simply supported beam of length L has a rectangular cross section of width b and height h. The beam carries the concentrated load P in the middle of its span. If L = 10h, determine the ratio of $\sigma_{max} / \tau_{max}$. | 10 |
| 5. | A horizontal steel girder having uniform cross-section is 14 m long and is simply support at its ends. It carries two concentrated loads as shown in Fig. 4. Calculate the maximum slope and the maximum deflection of the beam. Find the location of the maximum deflection from the right support.<br><br>Take E = 200 GPa and I = 160 × $10^6$mm$^4$. | 10 |

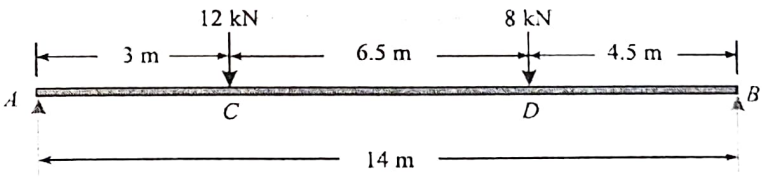


Fig. 4

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# SCHOOL OF MECHANICAL ENGINEERING

## CONTINUOUS ASSESSMENT TEST –II

**FALL SEMESTER 2022-2023**

**SLOT: C1+TC1**

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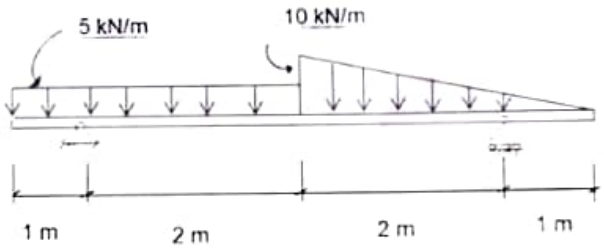
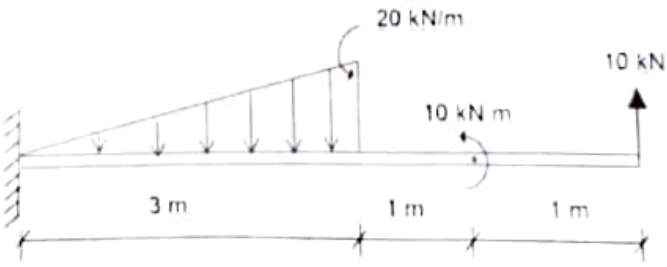
**Programme Name & Branch** : B. Tech, Mechanical Engineering
**Course Code** : BMEE202L
**Course Name** : Mechanics of Solids
**Faculty Name(s)** : Dr. Rajasekhara Reddy Mutra, Dr. Edwin Sudhagar P Dr. Rajesh M, Dr. Murugan M, Dr. Saurabh Gupta
**Class Number(s)** : VL2022230100566, VL2022230100571, VL2022230-100563, VL2022230100570, VL2022230100568

**Duration: 90 min.** **Max. Marks: 50**

General instruction(s): State and assume any Missing Data

| Q. No | Question | Marks |
|---|---|---|
| 1. | An overhanging beam of span 6 m is loaded with uniformly distributed load of intensity 5 kN/m and a uniformly varying load, which varies from 10 kN/m to 0 as shown in Fig. 1.<br>  <br><br>Fig. 1.<br>Draw the shear force and bending moment diagrams. Locate the points of contra flexure, if any. | 10 |
| 2. | A cantilever beam of span 5 m is loaded with an uniformly varying load, a counter clockwise moment and an upward point load as shown in Fig. 2. Draw the shear force and bending moment diagrams and find the maximum shear force and bending moment values.<br>  <br><br>Fig. 2 | 10 |

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## SCHOOL OF MECHANICAL ENGINEERING

**CONTINUOUS ASSESSMENT TEST -II**

**SLOT: C1+TC1**

**FALL SEMESTER 2022-2023**

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An overhanging beam is loaded in four points bending as shown in Fig. 3. The cross section of the beam is a rectangle of size 18 mm × 12 mm.

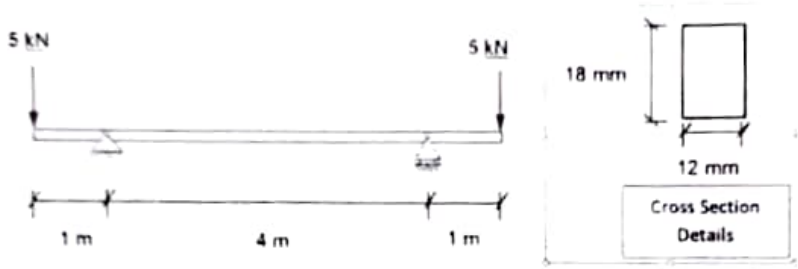


Fig. 3

Draw the bending moment diagram for the beam span and calculate the maximum bending stress and its location. 10

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A simply supported beam is of span 5 m and is loaded with a uniformly distributed load of 100 kN/m. The beam cross section is shown in Fig. 4.

Calculate the maximum bending stress and its location. 10

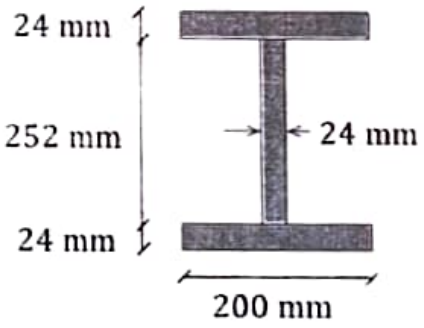


Fig. 4

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A square rod is of length 500 mm and is held horizontally with one end fixed. It is made up of low carbon steel with Young's Modulus 200 GPa and density 7850 kg/m$^3$. The cross section is square of side 3 mm.

Considering the load as a cantilever beam; derive an expression for its free end deflection due to its self-weight by double integration method. Also calculate the value of slope and deflection, at its free end. 10

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