**King Saud University**
**College of Engineering**
**Department of Civil Engineering**

## FINAL EXAM

### CE361 Structural Analysis I – 1st Semester 1426 - 27 H

**Saturday, 21$^{st}$ Dhul Hajjah 1426**
**Time allowed: 3 hrs**

| Student name | |
|---|---|
| Student number | |

*Total number of Questions: 5*

**Attempt all questions**

| Questions | Maximum Marks | Marks obtained |
|---|---|---|
| Q ≠ 1 | 7 | |
| Q ≠ 2 | 10 | |
| Q ≠ 3 | 13 | |
| Q ≠ 4 | 10 | |
| Q ≠ 5 | 10 | |

**Total marks** $\dfrac{\phantom{---}}{50}$

Total marks obtained (in words):_____
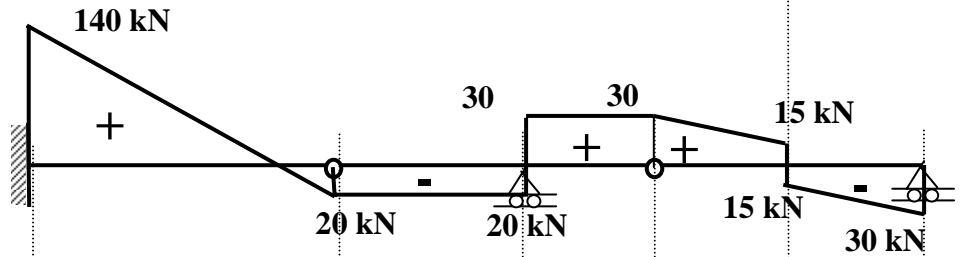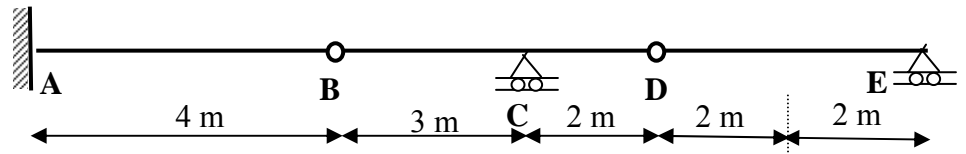
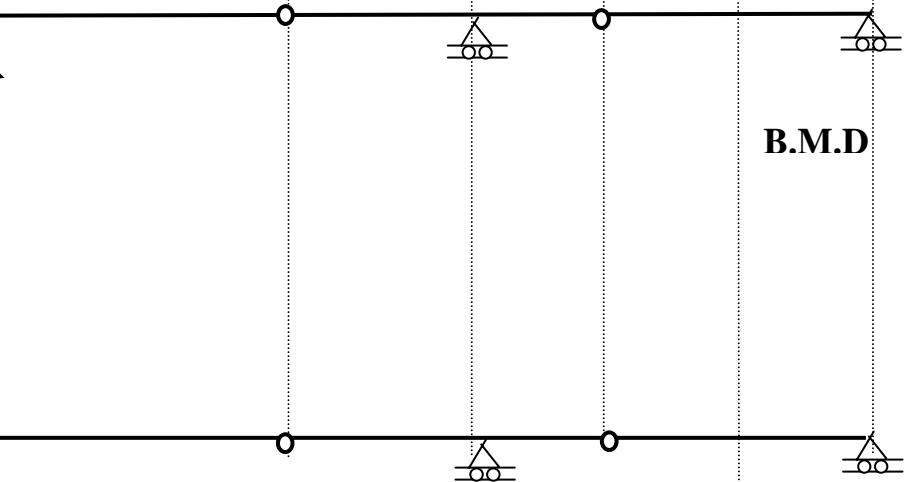| Student name | | **Marks obtained for Q1** | |
| Student number | | | |

## Problem 1: (7 points)

If the S.F.D of the given beam is as shown in diagram, use the information given in the S.F.D to:

1- Draw neatly the B.M.D, writing all necessary values, and determine the maximum + ve moments in span AB and DE.

2- Determine and draw the loads on the beam , showing all necessary values

A    4 m    B    3 m    C    2 m    D    2 m    E    2 m

140 kN

30    30    15 kN

+    −    +    +

20 kN    20 kN    15 kN    30 kN

-240 kN.m

**B.M.D**
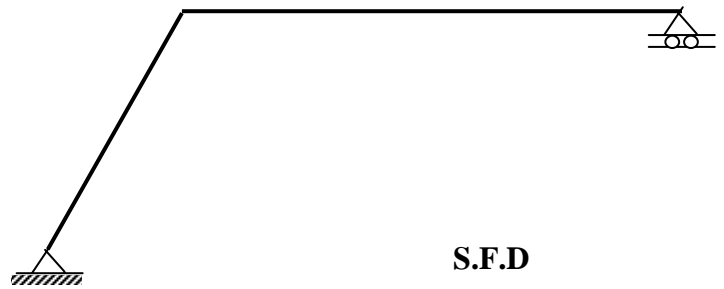
**Load**

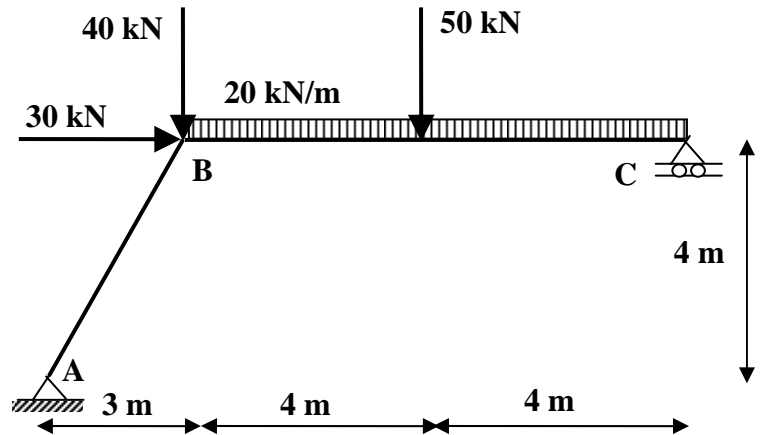| Student name | | **Marks obtained for Q2** | |
| Student number | | | |

## **Problem 2: (10 points)**

For the shown loaded frame, it is required to;

1- Determine the reactions at supports.

2- Draw the S.F.D and B.M.D

**40 kN**

**50 kN**

**20 kN/m**

**30 kN**

**B**

**C**

**4 m**

**A**

**3 m**    **4 m**    **4 m**

**S.F.D**

**B.M.D**

| Student name | | **Marks obtained for Q3** | |
| --- | --- | --- | --- |
| Student number | | | |

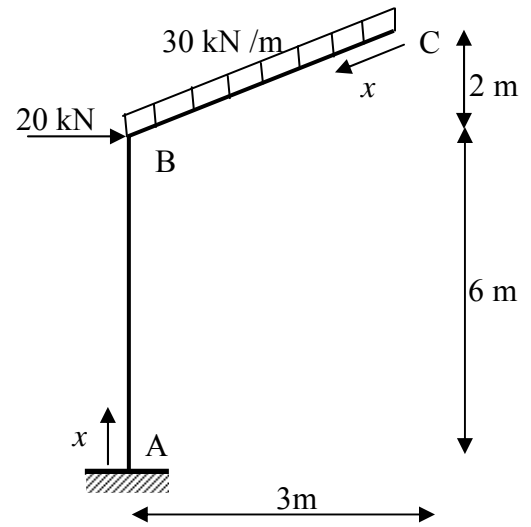## **Problem 3: (13 points)**

For the shown loaded frame, use the virtual work method to;

1- Determine the vertical deflection at point C

2- Determine the horizontal displacement at B

Given that; $I = 200 \times 10^6 \, mm^4$ and $E = 200 \, GPa$

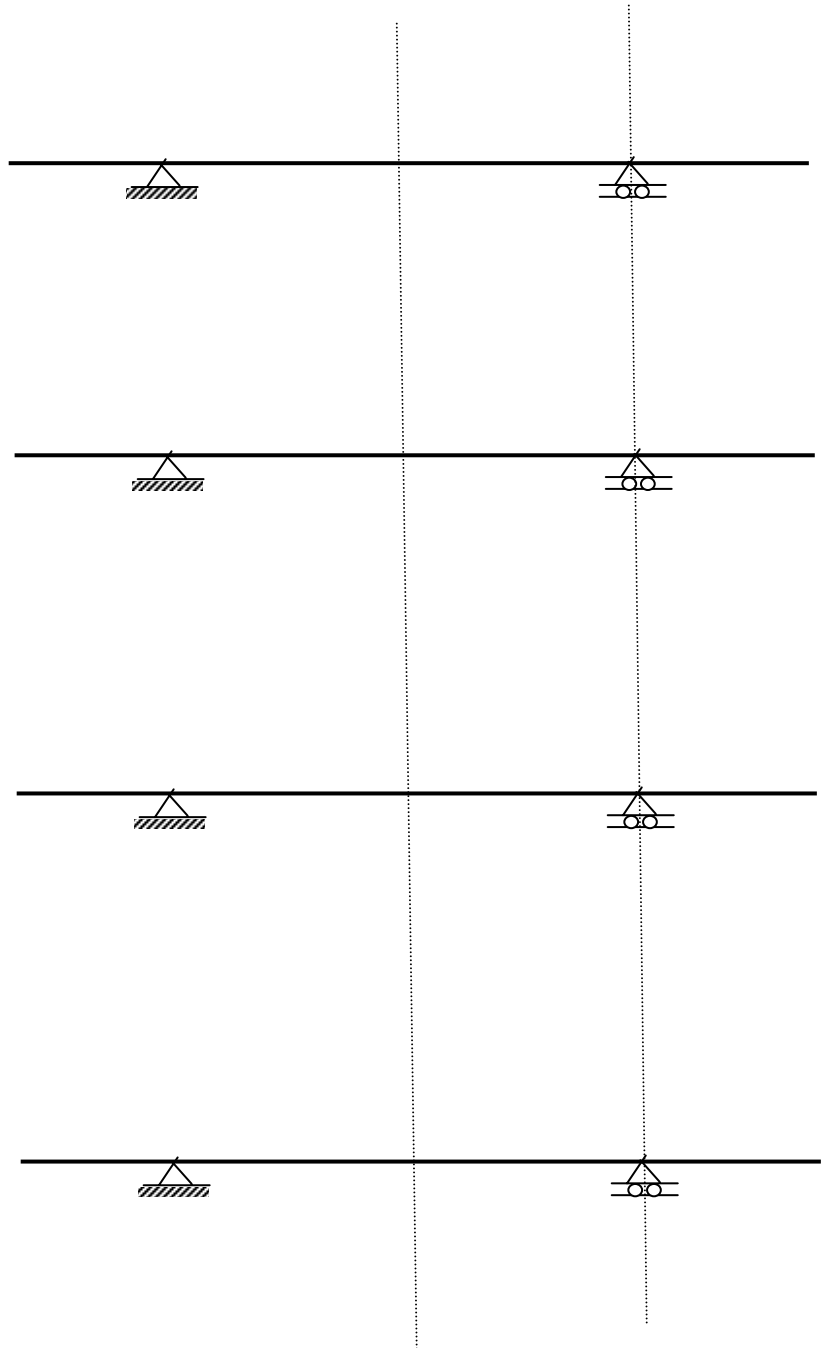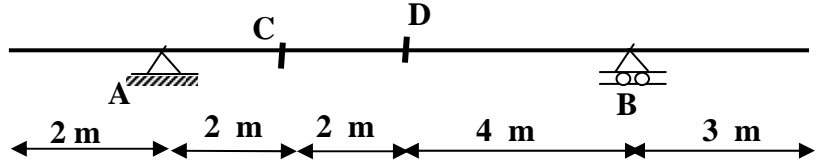| Student name | | **Marks obtained for Q4** | |
| Student number | | | |

## Problem 4: (10 points)

For the shown beam;

1- Draw the Influence lines of the reactions at supports

2- Draw Influence Line of shear at C
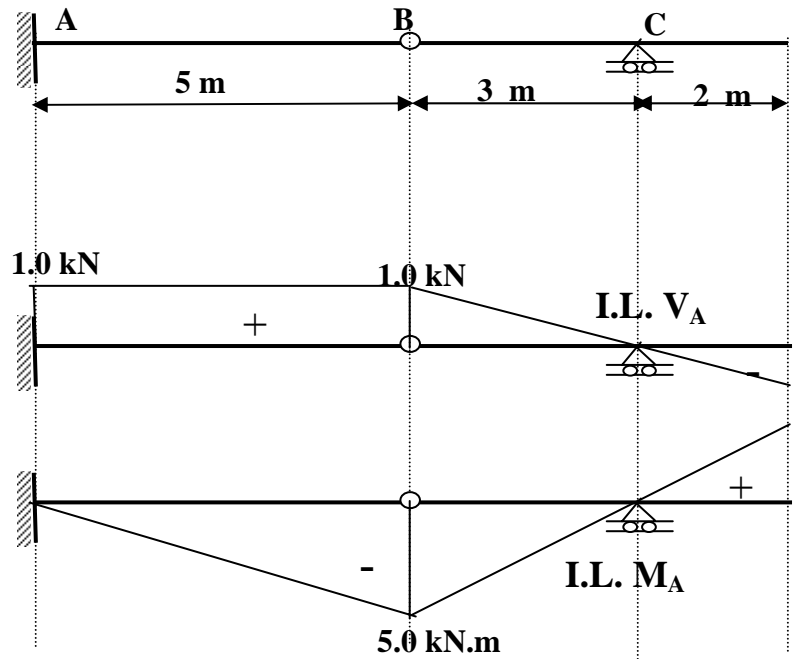
3- Draw Influence Line of moment at D

C   D

A   B

2 m   2 m   2 m   4 m   3 m

| Student name | | **Marks obtained for Q5 (A)** | |
| --- | --- | --- | --- |
| Student number | | | |

## Problem 5 (A) : (3 points)

A) The shown beam is subjected to uniform dead load 30 kN/m and uniform live load 40 kN/m. The Influence line of shear and moment at point A are as given in figures. It is required to determine;

1- The maximum +ve shear at point A due to dead and live loads.

2- The Maximum –ve moment at point A due to dead loads and live loads

A          B          C

5 m          3 m          2 m

1.0 kN          1.0 kN

I.L. V$_A$

+

I.L. M$_A$

+

−

5.0 kN.m

| Student name | | **Marks obtained for Q5 (B)** | |
| Student number | | | |

## **Problem 5 (B) : (7 points)**

B) Determine the absolute maximum moment due to the given moving loads on the bridge

**12 kN  10 kN  10 kN**

**1.2 m   0.80 m**   **8m**