

ELIZADE UNIVERSITY, ILARA-MOKIN  
 FACULTY OF ENGINEERING  
 DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING  
 SECOND SEMESTER 2016/2017 EXAMINATIONS  
 CVE 312: STRUCTURAL MECHANICS

Instructions: Attempt any FOUR questions.

Time allowed: 2.5 hrs.

**QUESTION 1 (15 marks)**

- a) Write short notes on support and support reactions. (7 marks)
- b) Draw the shear force and bending moment diagrams for the beam shown loaded in Figure Q1. Clearly mark the position of the maximum bending moment and determine its value. (8 marks)

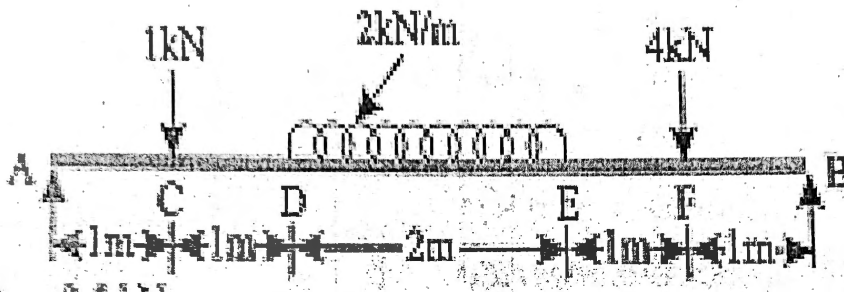


Figure Q1: A Beam carrying Specific loads

**QUESTION 2 (15 marks)**

Determine the forces in the members CD, DG, and GH for the truss shown in Figure Q2, using method of sections.

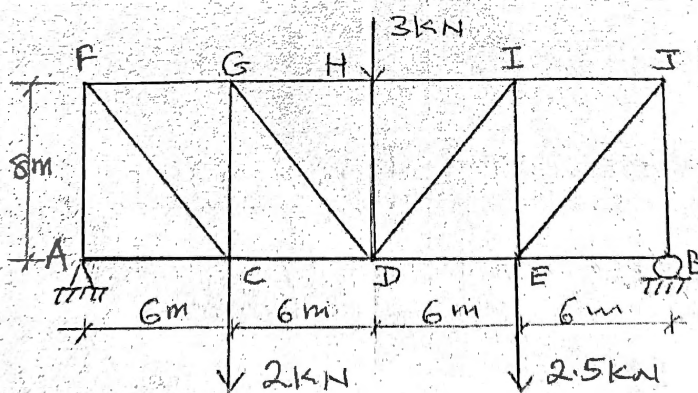


Figure Q2: A Truss carrying Loads

### QUESTION 3 (15 marks)

Calculate the values of maximum and minimum bending moments and shearing forces for the bending simply supported beam loaded as shown in Figure Q3. Draw the bending moment and shearing force diagrams indicating the significant values along the beam.

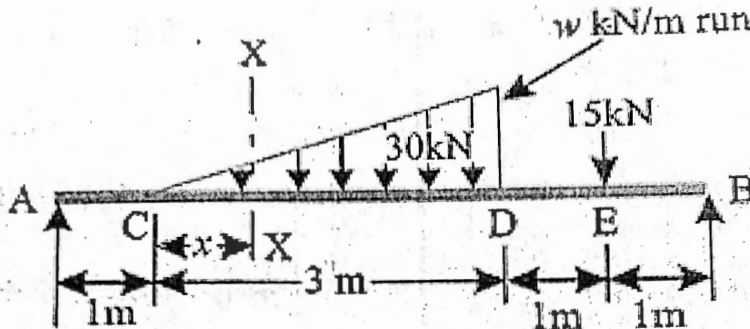


Figure Q3: A simply supported beam

### QUESTION 4 (15 marks)

Q4. For a cantilever with concentrated load  $W$  (kN) at the free end, using integration method, show that:

i. The slope at the free is  $\theta_B$ : 
$$\theta_B = \frac{Wl^2}{2EI}$$

ii. The deflection at the free is  $y_B$ : 
$$y_B = \frac{Wl^3}{3EI}$$

iii. Determine the slope  $\theta_B$  and deflection  $y_B$ , if the length of the cantilever is 1m, 0.15m wide and 0.1m deep,  $W = 50$  kN at the free end B and  $E = 210$  GPa. (5 marks)

Q5. Using moment area method:

- Determine, for a cantilever with concentrated load  $W$  (kN) at the free end, the slope and deflection at the free end. (5 marks)
- For a cantilever with uniformly distributed load  $w$  (kN/m), determine the slope and deflection at the free end. (5 marks)
- For a simply supported beam with concentrated load  $W$  (kN) at the center, determine the maximum slope and deflection. (5 marks)