MUSINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY

UNIVERSITY EXAMINATIONS
2013/2014 ACADEMIC YEAR

THIRD YEAR FIRST SEMESTER EXAMINATIONS

FOR THE DEGREE OF
BARCHELOR OF TECHNOLOGY
IN CIVIL AND STRUCTURAL ENGINEERING

COURSE CODE: **CSE 311**

COURSE TITLE: **THEORIES OF STRUCTURES III**

DATE: **TIME:**

INSTRUCTION TO CANDIDATES

- **This paper contains 5 questions**
- **Attempt question 1 and any other THREE questions**
- **Marks for each question are as indicated.**

Time: 3 hours

Q.1 (a) Define the following terms used in theories of structures:

1. Node
2. Element
3. Discrete
4. Degree of freedom (8 marks)

(b) Explain the three steps of direct stiffness matrix (3 marks)

(c) Derive the element stiffness matrix and explain all the terms of the matrix. (14 marks)

Q.2. Figure 1 shows the nodal forces and displacements at each node. Obtain the global stiffness matrix for the structural system. (15 marks)

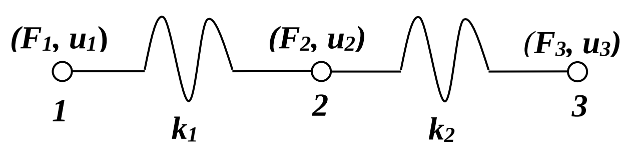

Figure 1

Q. 3.

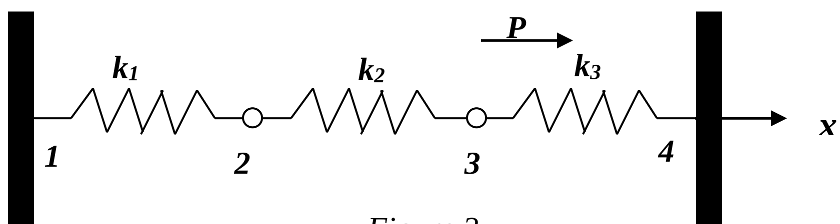

Figure 2

Given the spring system shown in figure 2 above

k_1 = 300 N/mm, k_2 = 200 N/mm, k_3 = 300 N/mm
$F_1 = 0\ N$, P = 800 N, $u_1 = u_4 = 0$,

Find: (a) The global stiffness matrix
(b) Displacements of nodes 2 and 3
(c) The reaction force at node 1 and 4
(d) The force in the spring 2 (15 marks)

Q.4. For the beam shown in figure 3, find the rotations of joints 2 and 3 and the bending moment diagram. Take. $EI = 6 \times 10^3$ kNm^2. (15 marks)

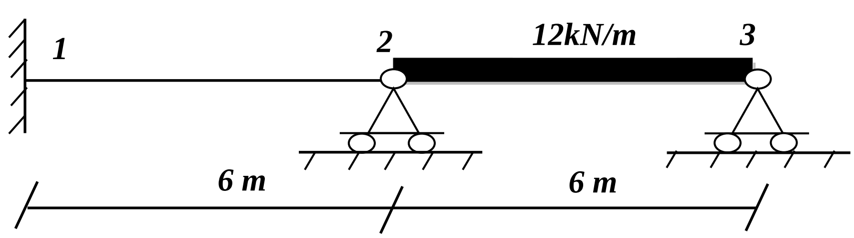

Figure 3

Q.5. For the truss shown in figure 4 determine the displacement at nodes 2 and 3. (15 marks)

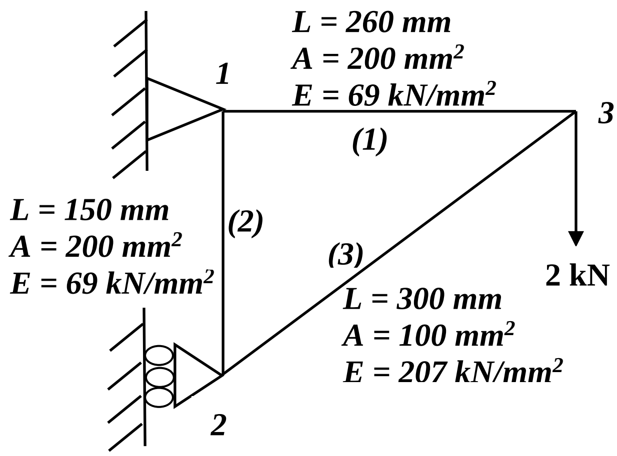

Figure 4