



MACHAKOS UNIVERSITY

University Examinations 2016/2017

SCHOOL OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

THIRD YEAR SECOND SEMESTER EXAMINATION FOR DEGREE IN
BACHELOR OF SCIENCE IN CIVIL ENGINEERING

ECV 312: THEORY OF STRUCTURES IV

DATE: 16/6/2017

TIME: 8:30 – 10:30 AM

INSTRUCTIONS

- *This paper comprises five questions*
- *Question **one** is **compulsory** and carries 30 marks*
- *All other questions carry 20 marks each*
- *Answer question **one** and any other **two** questions*

QUESTION ONE (30 MARKS)

- a) Elaborate the THREE types of relationships applied in structural analysis (12 marks)
- b) What is a spring's constant of stiffness. (2 marks)
- c) Explain the differences between force methods and displacement methods of structural analysis. (6 marks)
- d) Calculate the support reactions in the continuous beam ABC due to loading as shown in Fig.1.1 Assume EI to be constant throughout. (10 marks)

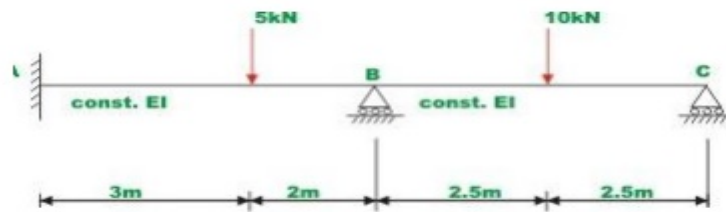


Fig 1.1

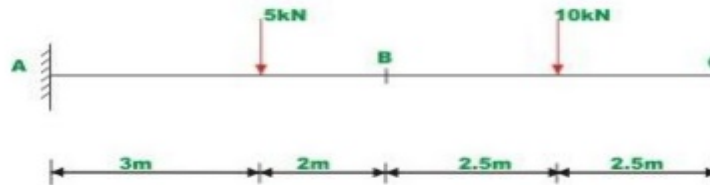
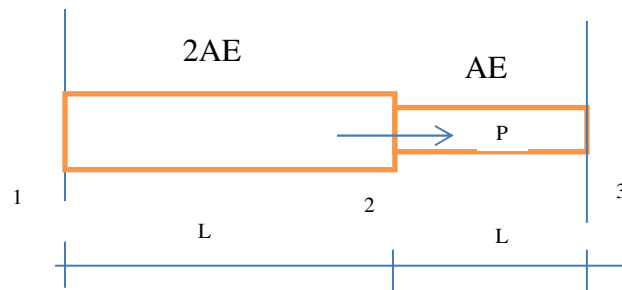


Fig 1.2

QUESTION TWO (20 MARKS)

- a) Find the stress in the two bar assembly which is loaded with force P and constrained at the ends as shown (14 marks)

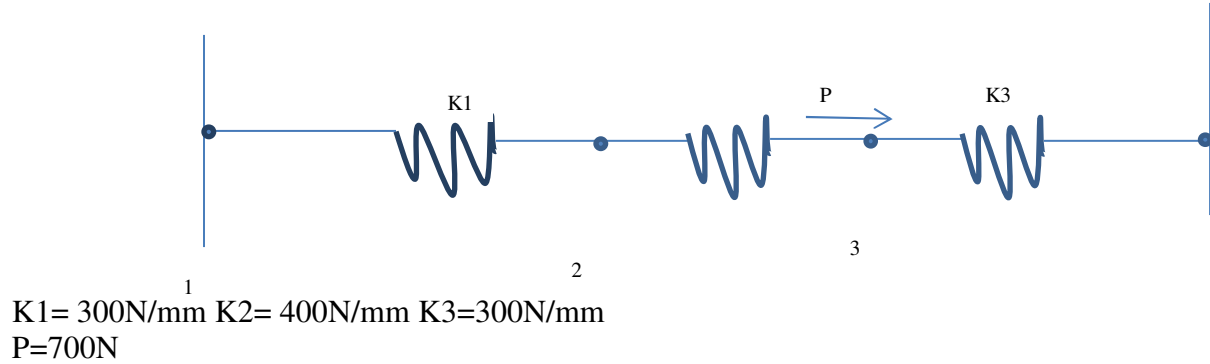


- b) List down the six different types of framed structures (6 marks)

QUESTION THREE (20 MARKS)

From the figure and values below, please find the following:

- Global stiffness matrix
- Displacement of nodes 2 and 3
- The reaction forces at nodes 1 and 4 (20 marks)



QUESTION FOUR (20 MARKS)

- Give three assumptions why most structural analysis problems are treated as linear problems (6 marks)
- Derive the displacement functions with the aid of a diagram (14 marks)

QUESTION FIVE (20 MARKS)

- Solve for the displacements in a small truss using the above approach (20 marks)

