THE TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering and Technology

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

UNIVERSITY EXAMINATION FOR DEGREE IN BACHELOR OF SCIENCE

CIVIL ENGINEERING

ECE 2317 THEORY OF STRUCTURES IV

END OF SEMESTER EXAMINATION

SERIES: DECEMBER 2016

TIME: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- Answer booklet

This paper consists of **FIVE** questions

Answer question **ONE (COMPULSORY)** from **SECTION A** and any other **TWO** questions from **SECTION B**

Maximum marks for each part of a question are clearly shown

This paper consists of **TWO** printed pages

SECTION A (*COMPULSORY -30 MARKS*)

QUESTION 1

(a) State the following:

i. Principle of virtual work **(2marks)**

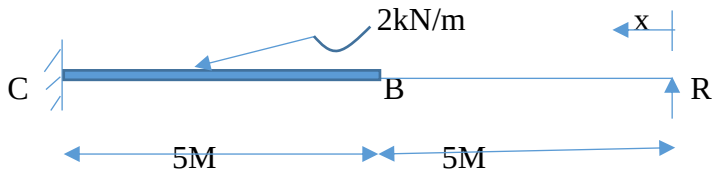
ii. Castigliano's Second Theorem **(2marks)**

iii. First moment of area theorem **(2marks)**

iv. Complementary Work **(2marks)**

v. Second Moment of Area Theorem **(2marks)**

(b)Using strain energy principle analyse the beam shown and draw the shear force and bending moment diagram **(20marks)**



SECTION B *(Answer any TWO questions from this section. Each question carries 20 marks)*

QUESTION 2

A rolled steel joist of 250mm x 125mm as shown below carries a single concentrated load of 20kN at the right third point over a simply supported span of 9m.

If the value of Ixx for the beam is $51.316x10^{6}mm^{4}$($51.316X10^{-6}M^{4}$) and the value of E for the material is 200GPa($200x10^{6}kN/m^{2}$) calculate by the use of conjugate beam method

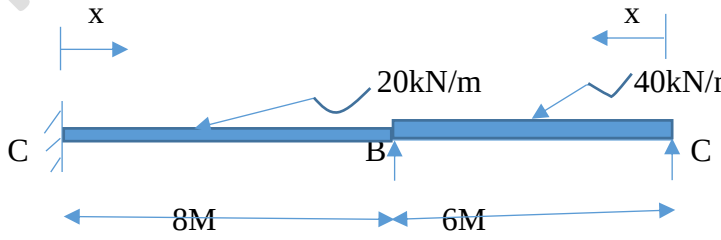
(i) Deflection under the load and

(ii) Maximum deflection on the span.

(20marks)

QUESTION 3

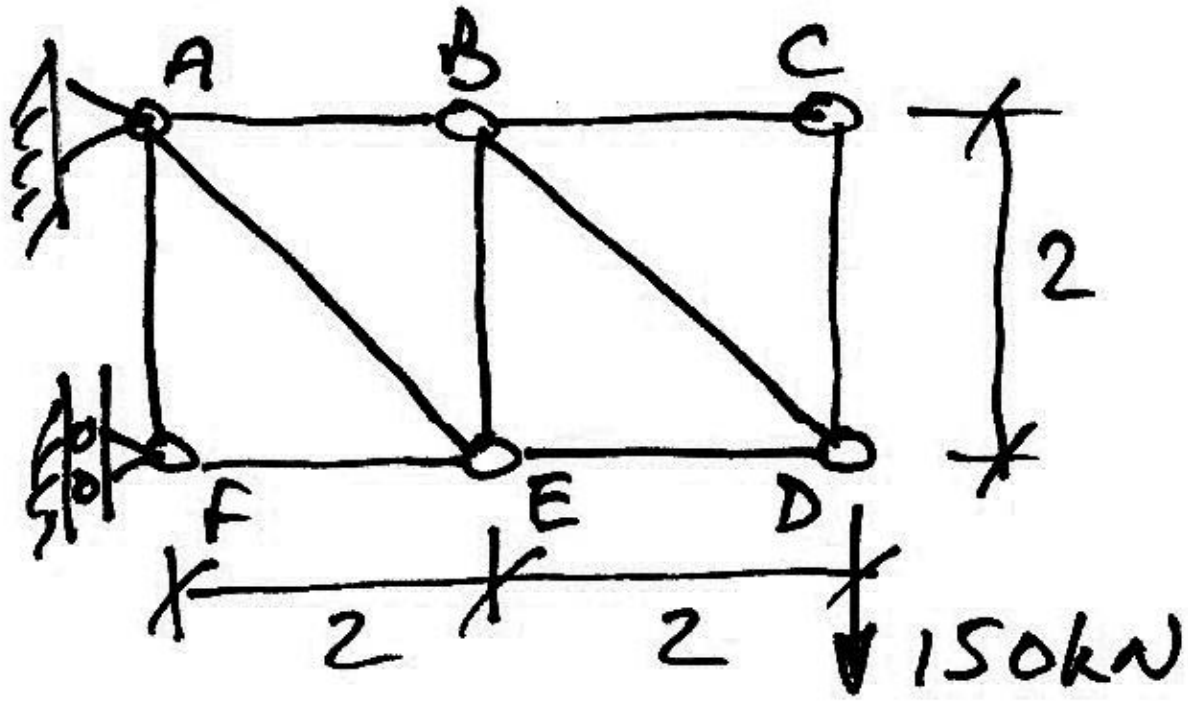
Using strain energy principle analyse the beam shown and obtain the reactions A, B and C, SFD and BBD. **(20marks)**



EI Constant

QUESTION FOUR

Determine the vertical and deflection of joint *D* of the truss shown. Take $E = 200$ kN/mm^2 and member areas, $A = 1000$ mm^2 for all members except *AE* and *BD* where $A = 1000\sqrt{2}$ mm^2. **(20marks)**



QUESTION FIVE

Using moment area method determine the deflection at B and the slope for the figure shown below (20marks)