TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF BUILDING & CIVIL ENGINEERING
UNIVERSITY EXAMINATION FOR:
TECHNOLOGY IN CIVIL ENGINEERING

ECE 2317 : **THEORY OF STRUCTURES IV**
END OF SEMESTER EXAMINATION
SERIES: JULY 2017
TIME: 2 HOURS
DATE:

Instructions to Candidates
You should have the following for this examination
-Answer Booklet, examination pass and student ID
This paper consists of five questions.
Attempt question ONE (Compulsory) and any other TWO questions.
Do not write on the question paper.

QUESTION ONE (COMPULSORY) 20 Marks
(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)

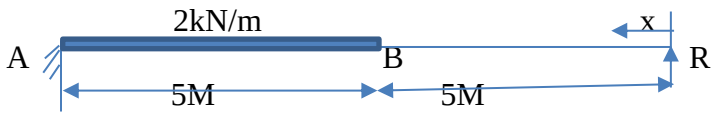


Figure Q1(b)

ANSWER ANY TWO QUESTIONS FROM THIS SECTION
QUESTION TWO (20 Marks)

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

(i) Deflection under the load and

(ii) Maximum deflection on the span.

(20marks)

Figure Q2

QUESTION THREE (20 Marks)

Analyze the continuous beam shown in Figure Q2 by the three moment equation. Draw the shear force and bending moment diagram.

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

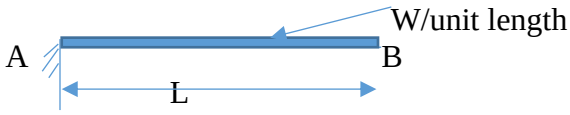
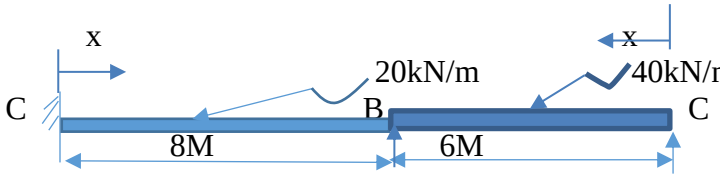


Figure Q3

QUESTION FOUR (20 Marks)

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



EI Constant

Figure Q4

QUESTION FIVE (20 Marks)

Determine the vertical and deflection of joint D of the truss shown. Take E = 200kN/mm2 and member areas, A = 1000 mm2 for all members except AE and BD where A = 1000√2 mm2.

(20marks)

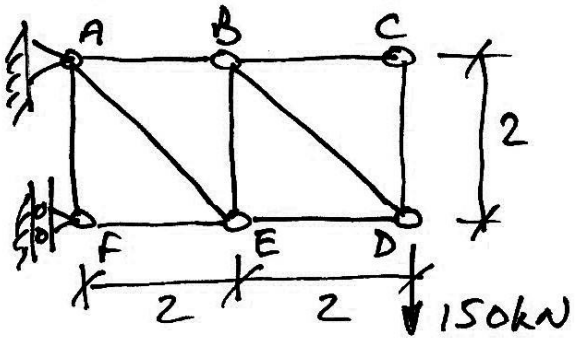


Figure Q5