TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL & AUTOMOTIVE ENGINEERING

UNIVERSITY EXAMINATION FOR:

BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING

EMG 2309 : SOLID &STRUCTURAL MECHANICS II

SPECIAL/SUPPLEMENTARY EXAMINATION

SERIES: AUGUST 2017

TIME: 2 HOURS

DATE: 19 Sep 2017

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 any THREE questions.

Do not write on the question paper.

Question ONE

A fletched composite beam consists of two timber sections each 150 mm wide by 40 mm deep and a steel plate 30 mm thick by 400 mm deep as shown in figure Q1.

a) Determine the moment of resistance of the composite beam if the maximum stress in the timber is limited to 8.5 MN/m^2.

(10 marks)

b) Find the maximum intensity of a uniformly distributed load which the beam can carry over a simply supported span of 6 m

(10 marks)

Question TWO

Determine the slope and deflection under the 50 kN load for the beam loading system shown in figQ2.Find also the position and magnitude of the maximum deflection. Take $E = 200GN/m^2$ and $I = 83 \times 10^{-6}\ m^4$. (20 marks)

Question THREE

A simply supported beam carrying a uniformly distributed load has a T-section as shown in Figure Q3. If the limiting stresses for the material of the beam are 80 MN/m^2 in compression and 160 MN/m^2 in tension, find the maximum intensity of the udl that the beam can carry over a span of 5m.

(20 marks)

Question FOUR

a) Show that for a rectangular section beam, the maximum shear stress distribution ,τ is given by

$$\tau = \frac{3Q}{2bd}$$

where Q = shear force, b and d are the breadth and depth respectively

(13 marks)

b) Sketch the shear stress distribution.
(7 marks)

Question FIVE

A beam of rectangular cross-section 50 mm wide and 100 mm deep is simply supported over a span of 1500 mm. It carries a concentrated load of 50 kN, 500 mm from the left support. Calculate

a) The maximum tensile stress in the beam and indicate where it occurs

(b) The vertical deflection of the beam at a point 500 mm from the right support. E for the material of the beam = 2 × 105MPa.

(20 marks)