



TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

UNIVERSITY EXAMINATION FOR:

BACHELOR OF SCIENCE IN CIVIL ENGINEERING

ECE 2407 : STRUCTURAL DESIGN I

END OF SEMESTER EXAMINATION

SERIES: DECEMBER 2016

TIME: 2 HOURS

DATE: 15 Dec 2016

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

-Drawing instruments.

This paper consists of five questions.

Attempt question ONE (Compulsory) and any other TWO questions.

Do not write on the question paper.

QUESTION ONE (30 Marks)

- (a) Check the stability of a 203 x 203 x 52UC in grade S275 steel to withstand an axial compressive load of 1250 kN over an unsupported height of 3.6 m assuming that both ends are held in position but are provided with no restraint in direction. (20 Marks)
- (b) Discuss three failure modes of steel beams when used in construction. (10 Marks)

QUESTION TWO (20 Marks)

- (a) Explain the classification methods of steel cross sections. (4 marks)
- (b) Design a base plate for the column shown in figure Q2(b) which is subjected to a combination of axial load, bending moment and shear force, given: (16 marks)

Axial compressive force, $F_c = 2300\text{kN}$

Overturning moment, $M = 100\text{kNm}$

Shear force $F_v = 40\text{kN}$

Design strength of plate = 270N/mm^2

Concrete compressive strength, $f_{cu} = 20\text{N/mm}^2$

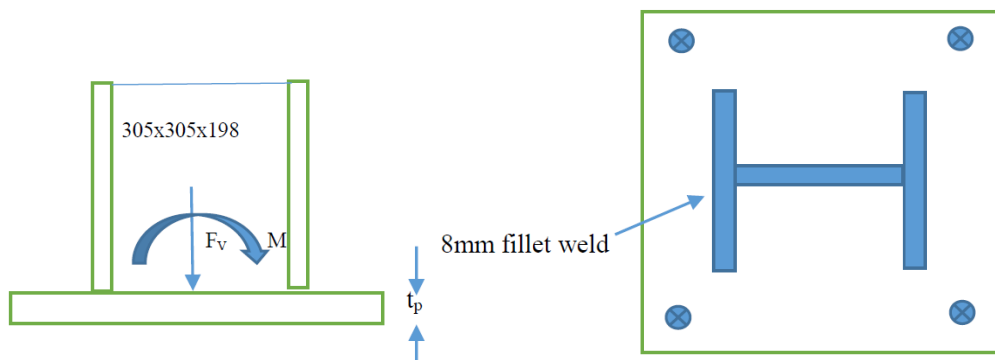


Figure Q2(b)

QUESTION THREE (20 Marks)

A main beam spans over an effective length of 2.8 m and supports a flooring system which exerts a long-duration load of 4 kN/m, including its own self-weight, over its span. Carry out design checks to see if a 75 mm x 300 mm deep sawn section imported whitewood Grade SS under service Class 1 is suitable (20 Marks)

QUESTION FOUR (20 Marks)

- (a) List five factors that can affect the strength of timber once used in construction of structures.
(5 Marks)
- (b) Design a simply supported steel beam in grade S275 to carry a dead load of 11 kN/m and live load of 18 kN/m. The effective span of beam is 8m. The ends of the beam are not free to rotate at the bearing.
(15 Marks)

QUESTION FIVE (20 Marks)

Design a single unequal angle to carry a dead load of 80 kN and an imposed load of 35 kN assuming bolted connection and welded connection in steel grade S275. (20 Marks)