



MACHAKOS UNIVERSITY COLLEGE

(A Constituent College of Kenyatta University)
University Examinations for 2015/2016

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

SECOND SEMESTER EXAMINATION FOR
DIPLOMA IN BUILDING CONSTRUCTION TECHNOLOGY
DIPLOMA IN CIVIL ENGINEERING

2707/302: STRUCTURES III

Date: 1/8/2016

Time: 8:30 – 10:30 AM

INSTRUCTIONS:

- This paper consists of **Eight** questions
- Answer any **Five** questions
- All questions carry equal marks

QUESTION ONE

- a) With the aid of labeled sectional sketches describe the following types of riveted joints:
- Lap joint
 - Double cover butt joint (6 marks)
- b) A single unequal angle section 100 X 75 X 10mm is welded to a gusset plate as shown in figure 1. It transmits a load of 150kN through its centroid. Design the joint using 8mm fillet welds.
- Permissible stress in weld = 100N/mm^2 (14 marks)

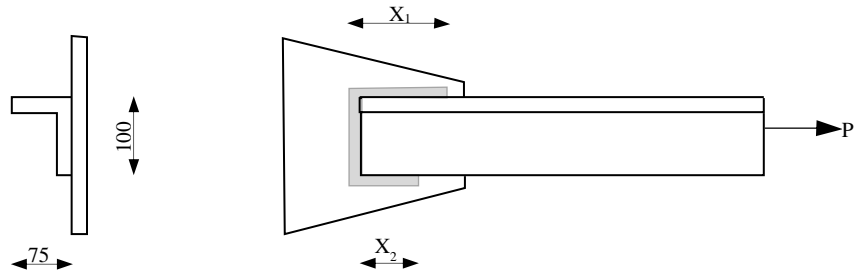


Fig. 1

QUESTION TWO

A nailed timber joint is required to carry a long term load of 4.0kN. The timber is softwood of strength class C16 and has a section size of 150 X 50mm.

Design and detail the joint if 4.2mm, 90mm long round wire nails are used (20 marks)

QUESTION THREE

A 150 X 20mm steel strap is spliced as shown in figure 1.

- Determine the safe tensile load that can be transmitted by the connection
- Determine the efficiency of the joint given the following data: (20 marks)

Nominal Rivet diameter = 20mm

Permissible shear stress = 100N/mm^2

Permissible bearing stress = 290N/mm^2

Permissible tearing stress = 120N/mm^2

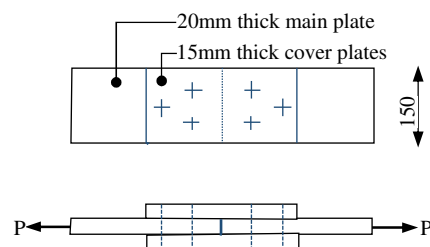


Fig. 2

QUESTION FOUR

A timber section 150 X 50mm of strength class C16 and effective span 3.0m is used as a simply supported beam. Assuming the beam is fully laterally restrained, check the adequacy of the timber beam in bending, bearing, shear and deflection given the following data: (20 marks)

Dead load = 0.5kN/m

Imposed load = 1.5kN/m

Bearing length = 100mm

Assume long term loading

Take all K factors as 1.0

QUESTION FIVE

A tie bar in a truss consisting of a double angle section 100 X 65 X 10mm is subjected to a load of 250kN and is welded to a gusset plate as shown in figure 3. Design the joint using 8mm fillet weld. Permissible stress in weld = 100N/mm^2 (20 marks)

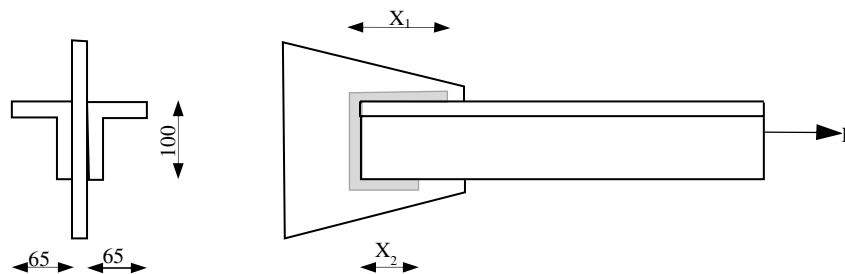


Fig. 3

QUESTION SIX

- a) Distinguish between the following types of strength grading of timber, giving two examples in each case:
 - i. Visual grading
 - ii. Machine grading (4 marks)
- b) Design a nailed lengthening joints for a timber truss compression member carrying an axial load of 10kN. The thickness of the member is 50mm and the timber is softwood of strength class C16 (SC2). Assume long term loading. (16 marks)

QUESTION SEVEN

Figure 4 shows a simply supported beam. Using equilibrium conditions, draw the influence line diagrams for the following loading conditions, plotting the values at every 2m intervals.

- i. Bending moment at point B
 - ii. Bending moment at point C
- (20 marks)

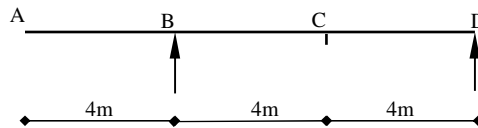


Fig. 4

QUESTION EIGHT

Figure 5 shows a simply supported beam. Sketch the influence line diagrams for the following load components.

- i. Reaction at A
 - ii. Shear at D
 - iii. Bending moment at D
- (20 marks)

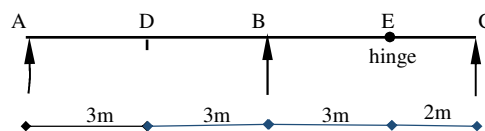


Fig. 5