



MACHAKOS UNIVERSITY COLLEGE

(A Constituent College of Kenyatta University)

University Examinations 2015/2016

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

SECOND SEMESTER EXAMINATION FOR DIPLOMA IN BUILDING TECHNOLOGY

DIPLOMA IN CIVIL ENGINEERING

2705/302 & 2707/302: STRUCTURES III

Date: 5/4/2016

Time: 8:30 – 10:30 am

INSTRUCTIONS

This paper consists of FIVE questions

Answer question one and other two questions in this paper

1. A suspended concrete floor slab 150mm thick is supported on simply supported universal beams of effective length 8m spaced at 3m centres. Select a suitable UB section for the internal beams in grade S275(grade 43) steel and hence check for bending, shear and deflection. Imposed load 3kN/m^2 , finishes 0.8kN/m^2 , $E=210\text{kN/mm}^2$ (20marks)
2. A simply supported universal beam supports uniformly distributed characteristic dead and imposed loads of 2kN/m each as well as characteristic imposed and dead point loads which are equidistant over an effective span of 9m as shown in figure 1. Assuming that the beam is fully laterally restrained and normal loading conditions, select a suitable universal beam in grade S275(grade 43) steel to satisfy bending, shear and deflection. $E=205\text{kN/mm}^2$ (20 marks)

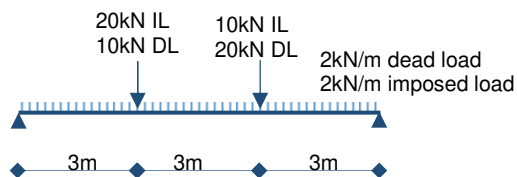


Fig. 1

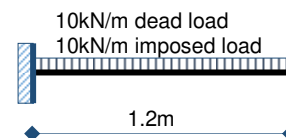


Fig. 2

3. A cantilever beam of effective length 1.2m is built into a concrete wall as shown in figure 2. It supports characteristic dead and imposed loads of 10kN/m and 10kN/m respectively. Select a suitable universal beam section in grade S275 steel to satisfy bending, shear, shear buckling and deflection $E=205\text{kN/mm}^2$ (20 marks)

4.

- a) Using a labeled sketch state six conditions that cased sections should meet in accordance with BS 5950
- b) Select a suitable column in grade S275 steel to support design loads from beams A and B as shown in figure 3. The column is 4m overall length and is held in position at both ends but only restrained in direction at the bottom.

(20 marks)

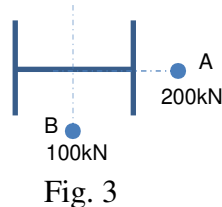


Fig. 3

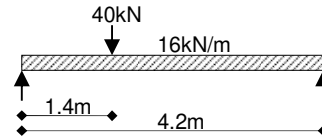


Fig. 4

5. A universal beam is loaded as shown in figure 4. Select a suitable UB section in grade S275 steel and check for bending and shear. Ignore the self-weight of the UB. Check for bending, shear and bearing. Take bearing width as 150mm. (20 marks)

6.

- a) With the aid of labeled sketches describe the following types of joints
 - i. Single riveted lap joint
 - ii. Single riveted butt joint
 - iii. Double riveted lap joint
 - iv. Double riveted butt joint

(8 marks)

- b) A 200 X 20mm steel strap is spliced as shown in figure 5. Determine:
 - i. The safe tensile load that the connection can carry
 - ii. The efficiency of the joint

(12 marks)

Allowable stresses:
 Shear - 70N/mm^2
 Bearing - 180N/mm^2
 Tearing - 90N/mm^2

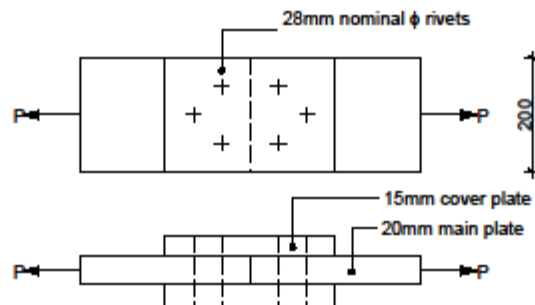


Fig. 5

7. Figure 6 shows the plan of a loaded column of actual length 3.7m carrying characteristic loads from three beams. It is fixed in position and direction at both ends. Select a suitable UC section for the column in grade S275 steel and check its adequacy (20 marks)

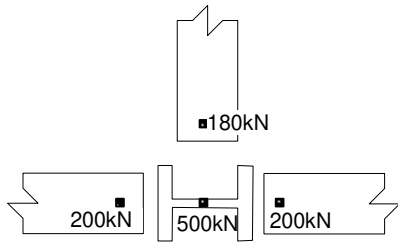


Fig. 6

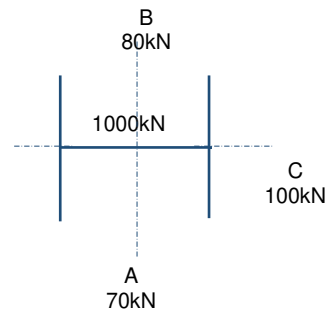


Fig. 7

8. A universal column supports a factored axial load of 1000kN and factored eccentric loads of 70kN, 80kN and 100kN as shown in figure 7. The column is 5m long and it is effectively held in position and partially restrained at both ends. Design the column in grade S275(grade 43) steel. Ignore the self weight of the column (20 marks)