



MACHAKOS UNIVERSITY COLLEGE

(A Constituent College of Kenyatta University)
University Examinations for 2014/2015

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

First Semester Examination for
Diploma in Building Technology
Diploma in Civil Engineering

2705/302:
2707/302:

STRUCTURES III

Date: 16/3/2015

Time: 8:30 -10:30 am

Instructions:

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

1. a) State four reasons for casing structural steel sections (4 marks)
b) Calculate the compressive resistance of a 254X254X107 UC section when cased in accordance with BS 5950. The effective length of the column about both axes is 4.0m. $f_{cu} = 25\text{N/mm}^2$ (16 marks)
2. 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)
3. 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 1. The column is 4m overall length and is held in position at both ends but only restrained in direction at the bottom. (20 marks)

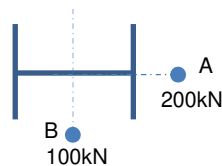


Fig. 1

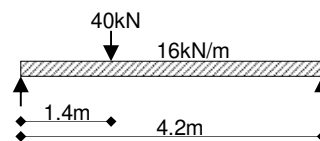


Fig. 2

4. A universal beam is loaded as shown in figure 2. 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)

5.

- a) With the aid of labeled sketches describe the following types of joints

- Single riveted lap joint
- Single riveted butt joint
- Double riveted lap joint
- Double riveted butt joint

(8 marks)

- b) A 200 X 20mm steel strap is spliced as shown in figure 3. Determine:

- The safe tensile load that the connection can carry
- The efficiency of the joint

(12 marks)

Allowable stresses:

Shear - 70N/mm^2

Bearing - 180N/mm^2

Tearing - 90N/mm^2

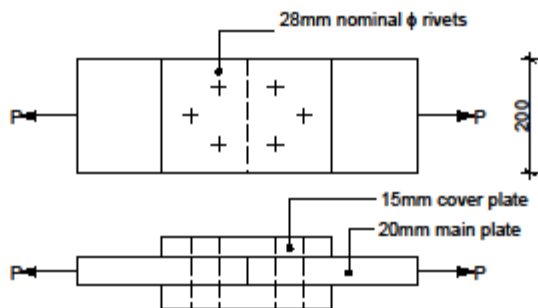


Fig. 3

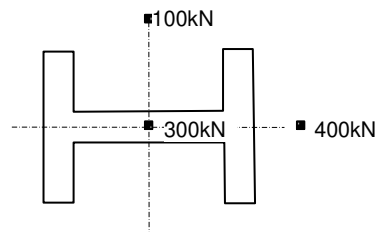


Fig. 4

6. Figure 4 shows a loaded stanchion of section 305 x 305 x 118 kg/m UC. Check the adequacy of the section when cased in accordance with BS 5950 if the column has an actual length of 4.5m and is fixed at one end and pinned at the other. $f_{cu} = 25\text{N/mm}^2$ (20 marks)
7. Figure 5 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)

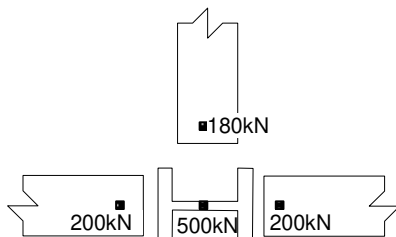


Fig. 5

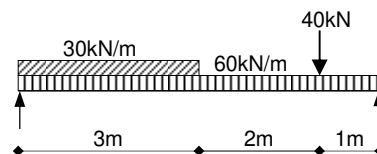


Fig. 6

8. A universal beam of effective span 6m is loaded with design loads as shown in figure 6. Select a suitable UB section in grade S275 steel and check for bending and shear. Ignore the self-weight of the UB. Also check for bearing assuming a bearing length of 200mm. (20 marks)