



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 CIVIL ENGINEERING

BCECD 313: STEEL AND TIMBER DESIGN

Date: 3/8/2016

Time: 2:00 – 4:00 PM

INSTRUCTIONS:

- This paper comprises of **five** questions
- Question **one** is **compulsory** and carry 30 marks
- Answer **question one** and any **other two** questions

1. A simply supported beam spanning 8m has a central point load and imposed loads of 200KN and 100KN respectively. Assuming the beam is fully laterally restrained select and check suitable UB sections in grade S275 steel to satisfy shear, bending and deflection criteria. (30 marks)
2. A 305 × 305 × 137 UC Section extends through a height of 3.5m.
 - a) Check that the section is suitable for plastic design using grade S275 steel. (15 marks)
 - b) Calculate the squash load for grade S275 steel. (5 marks)
3.
 - a) Explain with the aid of sketches the following terms used in welded connections:
 - i. Fillet weld
 - ii. Butt weld
 - iii. Throat size(9 marks)

- b) A bracket made from a $406 \times 178 \times 60$ universal beam is welded to a steel column as shown below. The bracket is designed to support an ultimate load of 500kN. Show the proposed welding scheme for this connection is adequate. Assume the steel is of grade S275 and the electrode strength is 42. (11 marks)
4. a) State the factors which influence the strength of timber and explain how the strength of timber is assessed in practice. (8 marks)
- b) A simply supported timber roof beam spanning 5m supports a total uniformly distributed load of 11kN. Determine a suitable section for the beam using timber of strength class C16. Assume that the bearing length is 125mm and that the compression edge is held in position. (12 marks)
5. a) Distinguish between softwood and hardwood and grade stress and permissible stress. (12 marks)
- b) Briefly explain the factors accounted for by the modification factor k_{12} in the design of timber compression members. (8 marks)