



MACHAKOS UNIVERSITY

University Examinations for 2021/2022 Academic Year

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

FOURTH YEAR FIRST SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE (CIVIL ENGINEERING)

ECV 404: STRUCTURAL DESIGN I

DATE: 29/8/2022

TIME: 11.00-1.00 PM

INSTRUCTIONS:

- This paper comprises of FIVE questions. Answer **THREE** questions
- Question one is **compulsory** and carry 30 marks
- Answer any other **TWO** questions
- All symbols have their usual meaning
- Only relevant design codes are allowed

QUESTION ONE (30 MARKS)

- a) Calculate the compressive resistance of a 203x203x60UC of height 3.2m. Assume that the conditions at both ends in the xx and yy planes are such as to provide simple support. Take the grade of the steel to be S275. (20 marks)
- b) Briefly discuss four ways in which a bolted structural steel connection may fail when in service. (10 marks)

QUESTION TWO (20 MARKS)

Design a simply supported beam carrying a concrete floor slab over a span of 5.0 m in grade S275 steel. The un-factored dead load, which includes and allowance for self-weight, is 14 kN/m, and the ultimate un-factored imposed load is 19 kN/m.

QUESTION THREE (20 MARKS)

Check the stability of a 203 x 203 x 52UC in 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.

QUESTION FOUR (20 MARKS)

- a) List five advantages that structural steel has over other construction materials when used in construction of structures. (5 marks)
- b) Design a single 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. (15 marks)

QUESTION FIVE (20 MARKS)

Design a simple base plate for a 254x254x73UC in steel grade S275 to carry a factored axial load of 100kN.