MACHAKOS UNIVERSITY

University Examination 2019/2020

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

FOURTH YEAR FIRST SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE IN CIVIL ENGINEERING

ECV 404: STRUCTURAL DESIGN I (STUDIO)

DATE:13/12/2019 **TIME: 2.00-4.00 PM**

INSTRUCTIONS

Answer Question One and Any Other Two Questions

All symbols have their usual meaning

Only relevant design codes are allowed

QUESTION ONE (30 MARKS)

a) The simply supported beam shown in Fig. Q1a supports uniformly distributed and imposed loads of 5 kN/m each, as well as an imposed point load of 30 kN at mid-span. Assuming the beam is fully laterally restrained select a suitable UB section in S275 steel to satisfy bending, shear and deflection conditions. (18 marks)

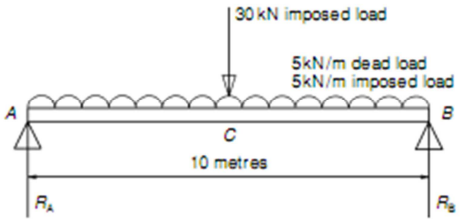

Fig Q1a

b) Briefly discuss four ways in which a bolted structural steel connection may fail when in service. (12 marks)

QUESTION TWO (20 MARKS)

a) Discuss three failure modes of steel beams when used in construction. (9 marks)

b) 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. (11 marks)

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 suitable base plate for a 203 x 203 x 60 UC S275 column section considering that it is caring an axial load of 1900kN.