

MACHAKOS UNIVERSITY
SCHOOL OF ENGINEERING AND TECHNOLOGY
DEPARTMENT OF BUILDING AND CIVIL ENGINEERING
FOURTH YEAR EXAMINATION FOR BACHELOR IN CIVIL
ENGINEERING
SPECIAL/SUPPLEMENTARY EXAM 2019/2020

ECV 404: DESIGN I (STUDIO)

INSTRUCTIONS

- i. Answer question one and any other two questions
- ii. All symbols have their usual meaning
- iii. 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)

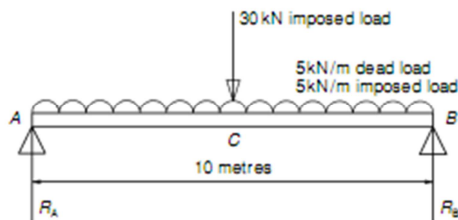


Fig Q1a

- (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 an 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. (20 Marks)

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.

QUESTION FIVE (20 Marks)

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