

SPECIAL PAPER

MAY – AUGUST 2015

ECE 2407: Structural Design I

INSTRUCTIONS

Answer question one (compulsory) and any other two questions
Relevant design codes are allowed

QUESTION ONE (30 Marks)

- (a) Check the stability of a 203 x 203 x 52UC in grade 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)
- (b) Discuss three failure modes of steel beams when used in construction.
(10 Marks)

QUESTION TWO (20 Marks)

Select a suitable UB section to function as a simply supported beam carrying a 140 mm thick solid concrete slab together with an imposed load of 7.0 kN/m^2 . Beam span is 7.2 m and beams are spaced at 3.6 m intervals. The slab may be assumed capable of providing continuous lateral restraint to the beam's top flange. (20 Marks)

QUESTION THREE (20 Marks)

A main beam spans over an effective length of 2.8 m and supports a flooring system which exerts a long-duration load of 4 kN/m , including its own self-weight, over its span. Carry out design checks to see if a 75 mm x 300 mm deep sawn section imported whitewood Grade SS under service Class 1 is suitable (20 Marks)

QUESTION FOUR (20 Marks)

- (a) Clearly discuss four factors that can affect the strength of timber once used in construction of structures. (12 Marks)
- (b) Determine the value of permissible bending stress parallel to grain and magnitude of maximum bending moment for a main beam of 50 mm x 200 mm deep Canadian fir larch grade SS under service class 2 and short-duration loading.
(8 Marks)

QUESTION FIVE (20 Marks)

- (a) Briefly discuss the two timber grading system used in grading of timber. (4 Marks)

- (b) Design a single angle tie in steel grade S355 for the member AB shown in Figure Q5(b). The member carries a dead load and imposed load of 122kN and 220kN respectively. Design for both welded and bolted connections. (16 Marks)

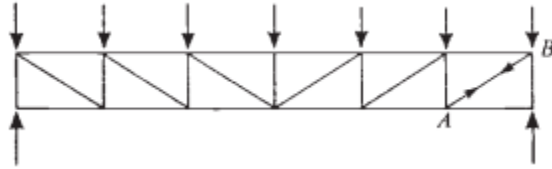


Figure Q5(b)