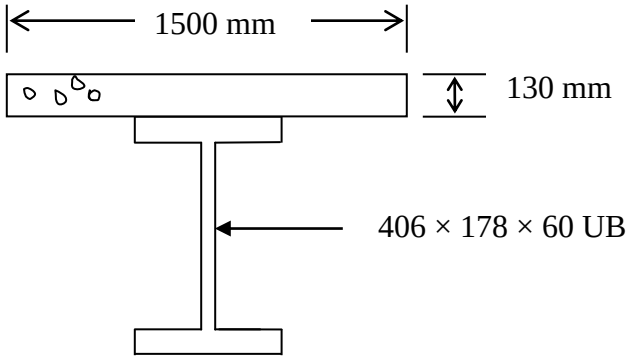
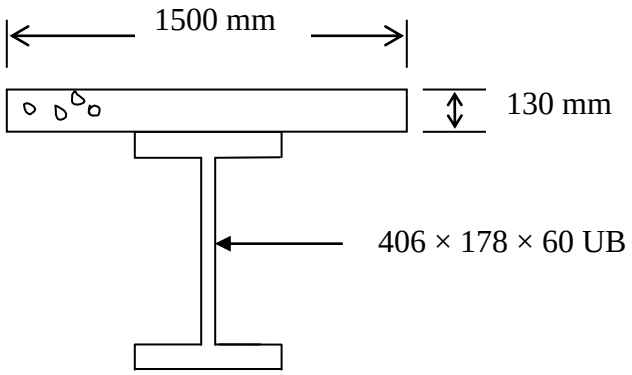
CEGE0021: CIVIL ENGINEERING IN PRACTICE

PROBLEM PAPER 3 - COMPOSITE CONSTRUCTION

Q1. Determine the moment capacity of the section shown below assuming the universal beam is of grade S275 steel and the concrete is of strength class C30/37.



Q2. Repeat question 1 assuming the beam is made of S460 steel. Also, design the shear connectors assuming the beam is 9m long and full composite action is to be provided.



Q3. Steel universal beams at 3.5 m centers with 12 m simple span are to support a 135 mm deep concrete slab of strength class C30/37. If the imposed load is 3.5 kN/m^2 and the weight of the partitions is 1 kN/m^2

a) select a suitable universal beam section in grade S275 steel
b) determine the number of 19 mm diameter × 100 mm long headed studs required
c) check the shear capacity
d) design the longitudinal reinforcement assuming f_{yk} = 500 N/mm^2 and check the longitudinal shear capacity of the section
d) calculate the serviceability deflection.

Assume the weight of the finishes and ceiling and service loads are 0.75 kN/m^2 and 0.5 kN/m^2 respectively. The density of normal weight reinforced concrete can be taken as 25 kN/m^3.