(*University of Choice*)

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

MAIN CAMPUS

UNIVERSITY EXAMINATIONS 2019/2020 ACADEMIC YEAR

FOURTH YEAR SEMESTER ONE EXAMINATIONS

FOR THE DEGREE OF BACHELOR OF SCIENCE IN CIVIL AND STRUCTURAL ENGINEERING

COURSE CODE: CSE 411

COURSE TITLE: STRUCTURAL STEEL DESIGN

DATE: MONDAY 13TH JANUARY 2020 TIME: 12.00 – 2.00 PM

INSTRUCTIONS:

1. This paper contains FIVE questions
2. Attempt ANY THREE questions
3. Marks for each question are indicated in the parenthesis.
4. Assume all steel sections to be Hot Rolled steel sections
5. BS 5950 (2000) and steel tables are permitted in this exam

Examination duration is **2 Hour**

MMUST observes ZERO tolerance to examination cheating

This Paper Consists of 4 Printed Pages. Please Turn Over.

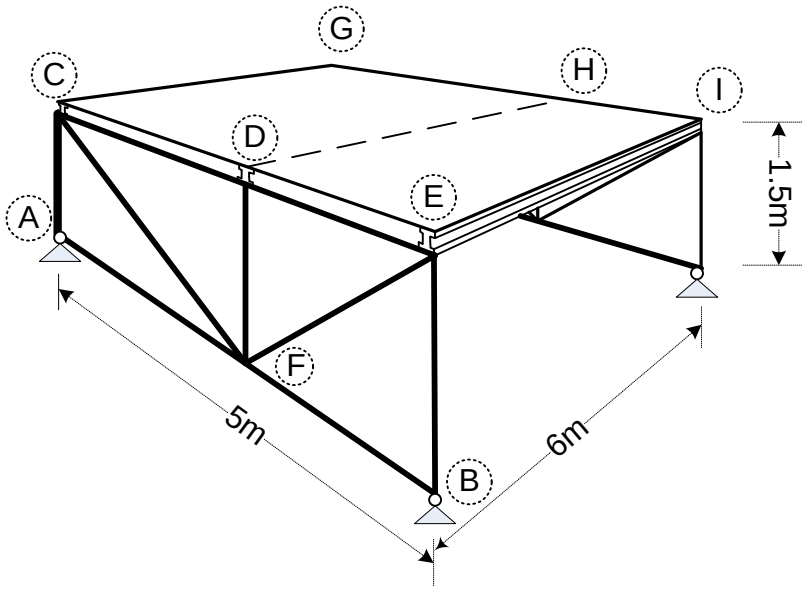


Figure Q1.a: Steel dais

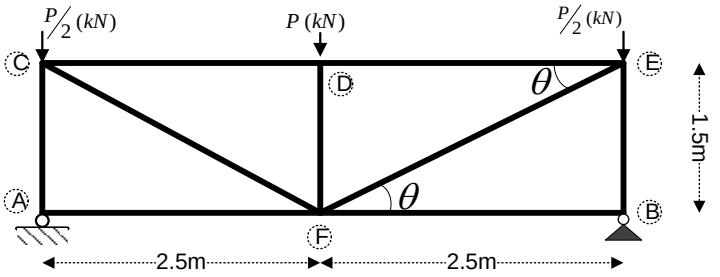


Figure Q1.b: Truss structure supporting main beams that support the dais deck

Question One (20 marks)

Using the figure of the truss system above, represents the support system for three beams that support the dais deck. The dais is loaded with a dead load of g_k=1.0kN/m^2 and Live load of q_k=4.0kN/m^2. The load result in a nodal loads where P=58.5kN

Assuming that the truss is fully pinned

a) Calculate the reactions at joints A and B (4marks)

b) Calculate the forces in the members (AC, AF, CF, CD, DF, BF, EF, BE, DE) clearly state whether the forces are Tensile (T) or compressive (C) (16 marks)

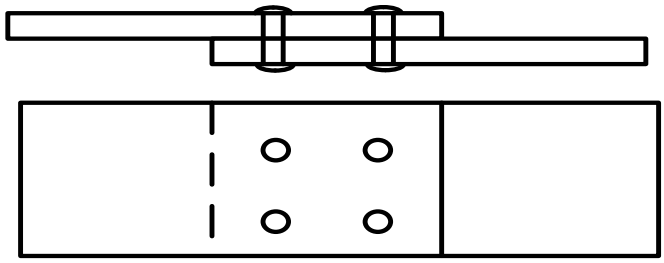
Question Two (20 marks)

Check the adequacy of using an Equal angle 100x100x6mm grade S275 section as member AC in compression.

Question Three (20 marks)

a) Check the adequacy of using an Equal angle 75x75x6mm grade S275 section as member CF in tension (8 marks)

b) Consider member CF (2.91m long) is joined at the center using a single splice joint using a 5mm thick steel plate using diameter 10mm grade 4.6 black bolts as shown below, determine the adequacy of the splice to carry the tensile load (12 marks)



Question Four (20 marks)

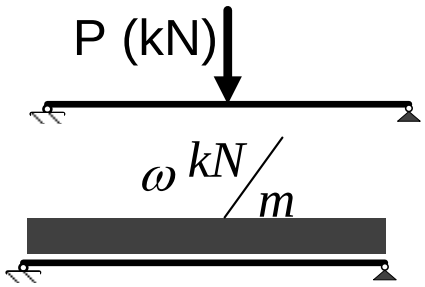
An I – section beam grade S275 will be used as member DH (6m long) to carry the deck. The beam is to carry a Dead load(g_k=2.5kN/m) and a live load (q_k=10kN/m)

a) Calculate and draw the shear force diagram and bending moment diagram (4 marks)
b) select a suitable section and classify the section according (2 marks)
c) Calculate the shear capacity (2 marks)
d) Check the moment capacity of the chosen section (8 marks)
e) Check the deflection of the member (4 marks)

Question Five (20 marks)

a) Design a base plate for the member AC at joint A. (10 marks)
b) State and explain the methods in with the base plate can be protected if the foundation will be in a wet and corrosive environment. (10marks)

MEMORY AIDE/ REFERENCE



$$\delta = \frac{PL^3}{48EI}$$

$$\delta = \frac{5\omega L^4}{384EI}$$

i) Calculation of deflections for simple supported beams

ii) Conversions

$1kN = 102kg$

iii) Properties of steel

3.1.3 Other properties

For the elastic properties of steel, the following values should be used.

— Modulus of elasticity:	$E = 205\,000$ N/mm²
— Shear modulus:	$G = E/[2(1 + \nu)]$
— Poisson's ratio:	$\nu = 0.30$
— Coefficient of linear thermal expansion (in the ambient temperature range):	$\alpha = 12 \times 10^{-6}$ per °C