



PROGRAM : NATIONAL DIPLOMA
BUILDING

SUBJECT : **STRUCTURES 3**

CODE : **SAC3000**

DATE : NOVEMBER EXAMINATION
19 NOVEMBER 2019

DURATION : (SESSION 1) 12:30 -15:30

WEIGHT : **50:50**

TOTAL MARKS : 100

ASSESOR : Prof I. MUSONDA File Number

MODERATOR : MR F. THAIMO 2300

NUMBER OF PAGES : 4 PAGES

REQUIREMENTS : FORMULA SHEETS AND TABLES

INSTRUCTIONS TO CANDIDATES:

PLEASE ANSWER ALL THE QUESTIONS. WRITE CLEARLY AND
NUMBERED ALL THE QUESTIONS ANSWERED.

Section 1.0 [30]

- 1.1 A reinforced concrete beam with an effective depth of 350mm and 230mm wide is reinforced with three 16 mm diameter high yield reinforcement bars to resist a sagging moment. The beam properties are as follows:
- a) Concrete grade = 25 N/mm²
 - b) Steel grade = 450N/mm²

What is the maximum moment that the beam can withstand? **(10)**

- 1.2 Design for both moment and shear if a simply supported reinforced concrete beam has the following dimensions and properties:
- a) Beam height = 400 mm
 - b) Beam width = 230mm
 - c) Maximum shear force = 100kN
 - d) Maximum bending moment = 100.4kNm
 - e) Concrete grade = 30 N/mm²
 - f) Main Steel strength: 450N/mm²
 - g) Stirrups strength: 250N/mm² **(20)**

Section 2.0 [40]

- 2.1 Study the steel beam in figure 2.0 and answer the following questions.

Questions:

- a) What are the reactions **(4)**
- b) What are the shear forces that the beam is subjected to **(8)**
- c) What are the bending moments in the beam **(8)**
- d) Draw the bending moment and the shear force diagrams indicating all the values; **(6)**
- e) What is the maximum bending moment **(2)**

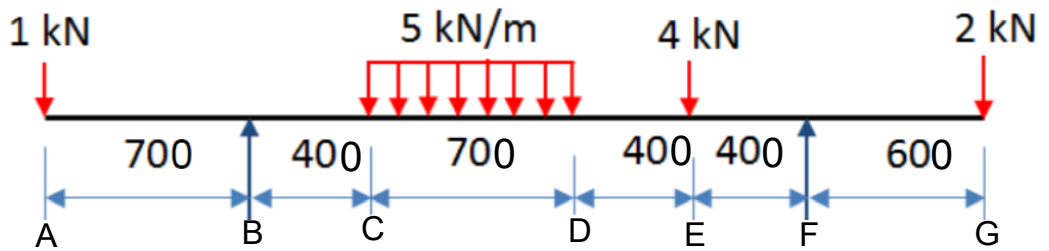


Figure 2.0 (measurements are in mm)

- 2.2 Using the maximum bending moment and shear forces calculated in 2.1 above, select the suitable steel beam (I-beam) that can be used to carry these loadings. The beam's yield stress is 275 N/mm^2 . Further, check whether the beam can withstand the shear force imposed on it **(12)**

Section 3.0 [30]

- 3.1 Study the framed structure in figure 3 and respond to the following questions:

Questions:

- What are the reactions at supports A and C **(3)**
- What type of forces act through all the members of the framed structure **(9)**
- What is the magnitude of forces in each one of the members of the framed structure **(18)**

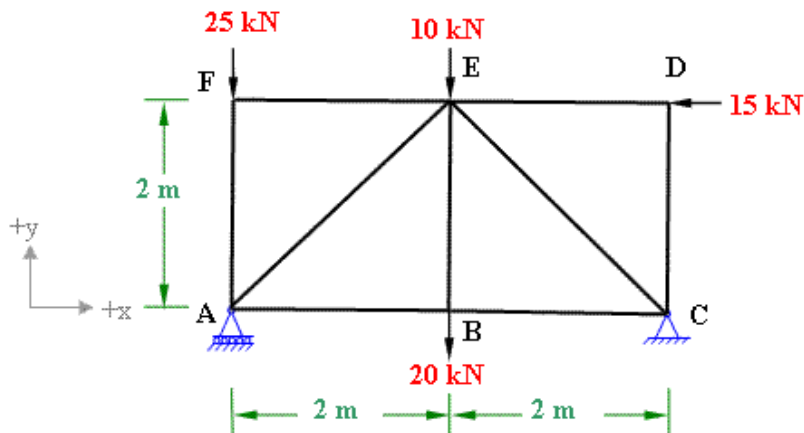


Figure 3.0

