PROGRAM : NATIONAL DIPLOMA
BUILDING

SUBJECT : **STRUCTURES 3**

CODE : **SAC3000**

DATE : SSA EXAMINATION
January 2020

DURATION : (SESSION 1) 8:30 -12:00

WEIGHT : **50:50**

TOTAL MARKS : 85

ASSESOR : Prof I. MUSONDA   File Number

MODERATOR : MR F. THAIMO   2300

NUMBER OF PAGES : 3 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 [35]

1.1 A structural steel beam, measuring 6 meters in length and simply supported at the two ends, is loaded uniformly with a load of 12kN/m. The beam has a yield stress of 275N/mm2.

What is the:
a) Reaction at support A and B;   **(2)**
b) Maximum bending moment;   **(2)**
c) Maximum shear force;   **(2)**
d) Bending moment diagram;   **(2)**
e) Shear force diagram;   **(2)**
f) Section modulus (Z_{pl}) of the required beam;   **(2)**
g) Suitable I-beam that can be used to sustain the applied loads;
                                                                                              (2)
h) Average shear stress;   **(2)**
i) Shear capacity of the selected beam;   **(2)**
j) Decision on suitability of the selected I-Beam;   **(2)**

1.2 Figure 1.0 below shows a 254x146x37kg cantilevered I beam. It has a yield stress of 275N/mm^2. What is the maximum point load that the beam can carry? Give the answer in KN.   **(15)**
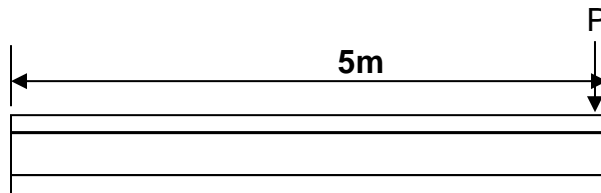
P

5m

Figure 1.0

 (15)

Section 2.0 [20]

2.1 A reinforced concrete beam with an effective depth of 400mm and 230mm wide is reinforced with two, 16 mm diameter high yield reinforcement bars. If the RC beam has a concrete strength of 25 N/mm^2 and the main reinforcement steel strength is 450N/mm^2, what is the ultimate moment capacity that cannot be exceeded   **(10)**

2.2 Calculate the shear reinforcement required for a rectangular beam with the following properties: **(10)**
   a) Beam height = 500mm
   b) Beam width = 250mm
   c) Maximum shear force = 200kN
   d) Reinforcement = 4Y20
   e) Concrete strength = 30 N/mm²
   f) Main Steel strength = 450N/mm²
   g) Stirrups strength = 250N/mm²

Section 3.0 [30]

3.0 Study Figure 2.0 below and answer the following questions.
   a) What are the reactions at supports A and C **(3)**
   b) What type of forces act through all the members of the framed structure **(9)**
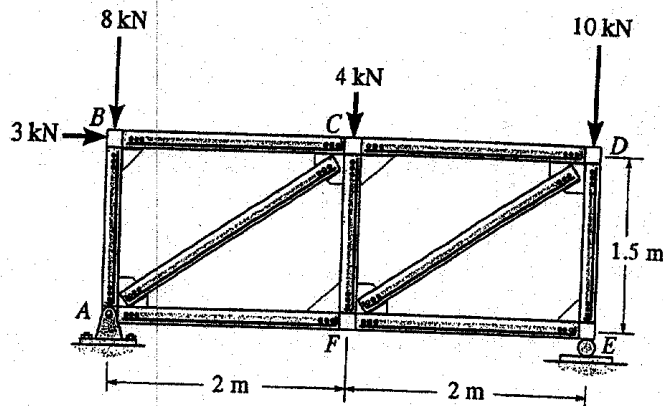   c) What is the magnitude of forces in each one of the members of the framed structure **(18)**

Figure 2.0