University of Wales Trinity Saint David

School of Architecture, Built and Natural Environments

BSc Civil Engineering

Programme:	**BSc Civil Engineering**		
Module:	**Engineering Mathematics and Structure**		
Module code:	**ACBA 4007**	**Contribution to Overall Module Assessment (%):**	**50%**
Lecturer:	**Dr Jamiu A. Dauda**	**Internal Verifier:**	**Dr Deborah Hughes**
Assessment Title:	**Examination**	**Word count (or equivalent):**	**N/A**
Date:	**20th January 2022**	**Time:**	**9:00 am – 11:00 am (2 Hours)**
Instructions to Candidates	**Answer all questions in SECTION A and two questions from SECTION B**		

SECTION A

Answer all questions from section A

Question 1 (40 Marks)

Referring to the quadrilateral shown in Figure 1

a) Find all the unknown sides and the angles

b) Find the area of triangle ABC

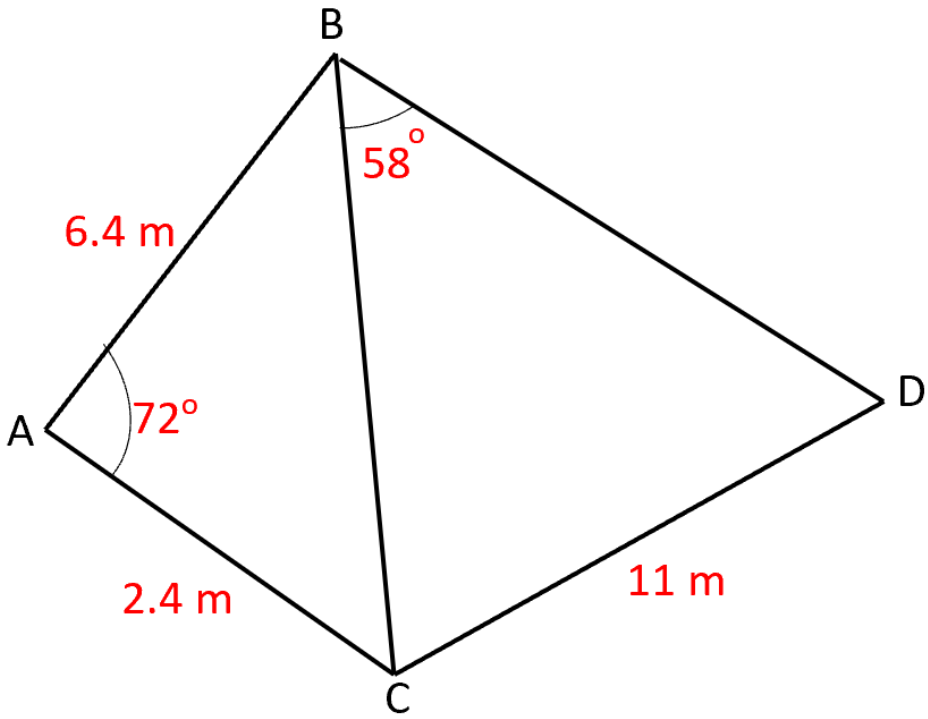

Figure 1

SECTION B

Answer question 2 and one from questions 3 and 4: All questions carry equal marks.

Question 2 (30 Marks)

a) Name and illustrate with diagram, the three most common types of supports used in beam (**6 marks**)

b) Identify with diagram the reactions forces associated with each support type mentioned in question 2 (a) above (**3 marks**)

c) Calculate the support reaction for the beam shown in figure 2. (**6 marks**)

d) Using the support reaction calculated in question 2(c), draw the shear force and bending moment diagrams for the beam in figure 2. (**15 marks**)

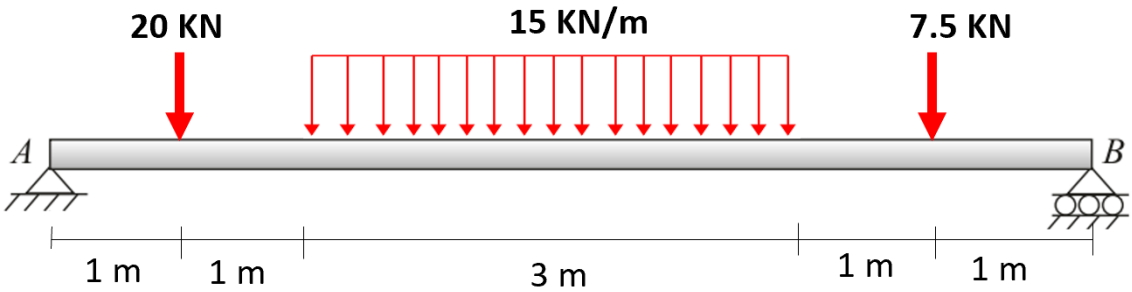

Figure 2

Question 3 (30 Marks)

a) What is the difference between the centroid and centre of gravity of a body (**4 marks**)

b) Illustrate with diagram the centroid and centre of gravity of object with uniform material (**3 marks**)

c) Illustrate with diagram the centroid and centre of gravity of object with 2 different materials (**3 marks**)

d) Find the centroid of the section shown in Figure 3. (**20 marks**)

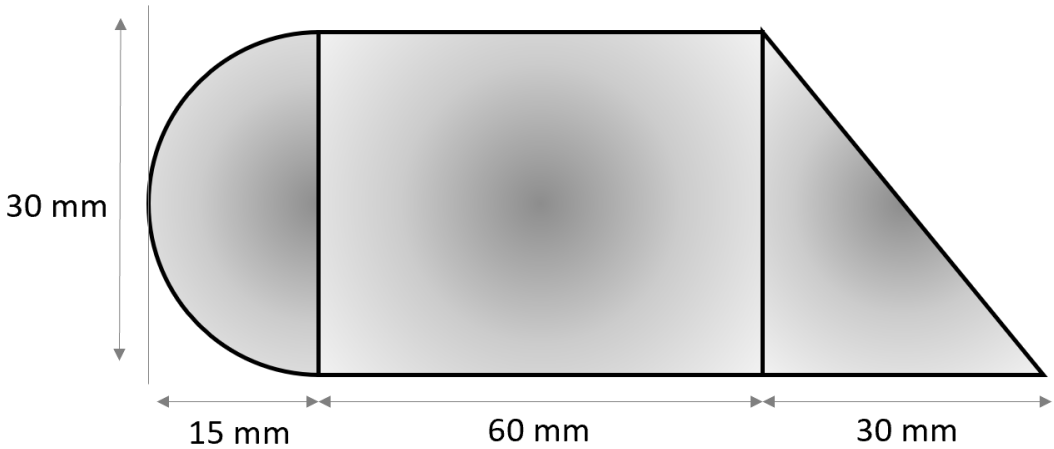

Figure 3

Question 4 (30 Marks)

a) Find the centroid of the Z- section shown in Figure 4 (**10 marks**)

b) Using the result from question 4 (a), find the second moment of area of the section about the centroidal axes XX and YY (**20 marks**)

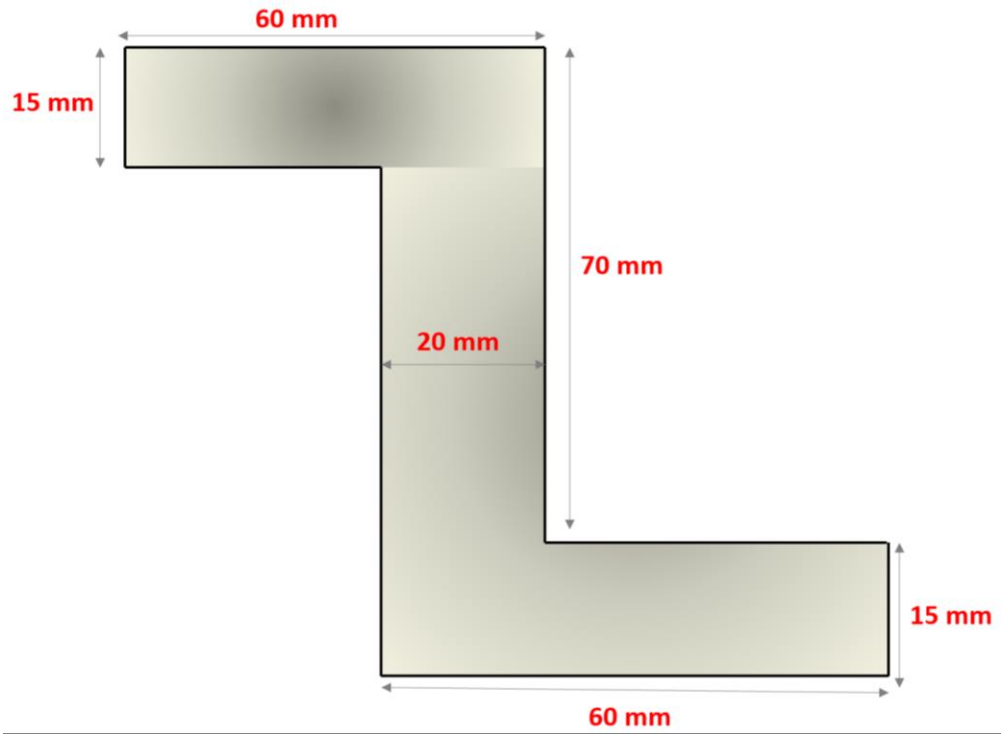

Figure 4