Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2023/2024

COURSE NAME	:	STATIC AND DYNAMIC
COURSE CODE	:	BFC 10103
PROGRAMME CODE	:	BFF
EXAMINATION DATE	:	JULY 2024
DURATION	:	3 HOURS
INSTRUCTIONS	:	1. ANSWER ALL QUESTIONS 2. THIS FINAL EXAMINATION IS CONDUCTED VIA ☐ Open book ☒ Closed book 3. STUDENTS ARE **PROHIBITED** TO CONSULT THEIR OWN MATERIAL OR ANY EXTERNAL RESOURCES DURING THE EXAMINATION CONDUCTED VIA CLOSED BOOK

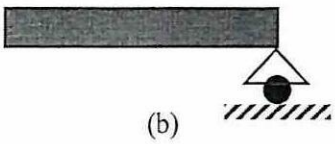
THIS QUESTION PAPER CONSISTS OF **FIVE (5)** PAGES.

Q1 Answer these theoretical questions.

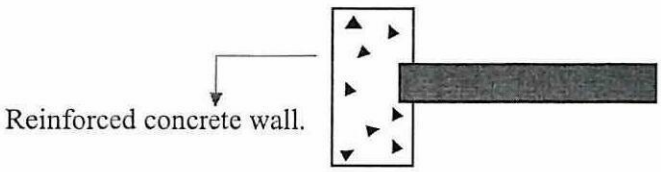
(a) Referring to **Figure Q1.1**, identify and explain the type of support system depicted including any rotation and translation present.

(6 marks)

(a)



(b)



(c)

Figure Q1.1

(b) Explain the concept of a fixed support and its key characteristics, including constraints on movement and rotation. Then compare and contrast fixed supports with other types of supports commonly used in structural design.

(4 marks)

(c) A system of forces refers to a collection of individual forces acting on an object or system. List and explain the **FOUR (4)** types of force systems.

(8 marks)

(d) **Figure Q1.2** shows, a concrete slab supports six vertical loads. Calculate the coordinates (x and y) of the point on the slab where the resultant of the loading system passes.

(18 marks)

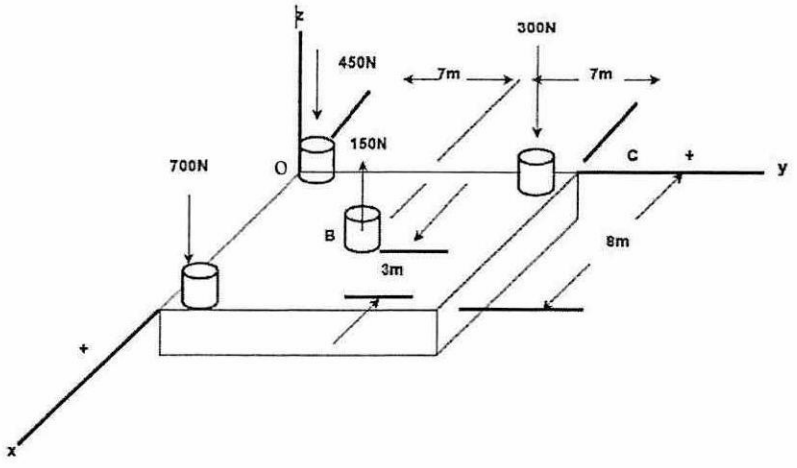


Figure Q1.2

Q2 These questions assess your understanding in centroid and centre of gravity.

(a) Define

(i) centre of gravity

(ii) centroid

(4 marks)

(b) Based on **Figure Q2.1**,

(i) Determine the centroid position of the structure using the negative area method.

(10 marks)

(ii) Calculate the moment of inertia of the structure using parallel-axis theorem method.

(15 marks)

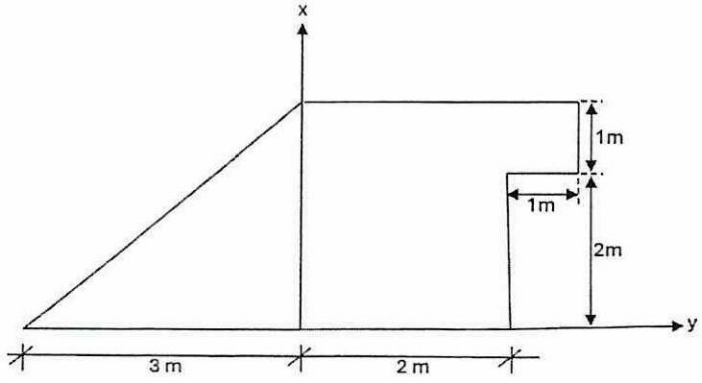


Figure Q2.1

Q3 You are employed as a structural engineer for an architectural firm specializing in residential constructions. Your current project involves designing the roof structure for a new house in a suburban neighbourhood. **Figure Q3.1** shows the plane truss of roof arranged with all purlins on its node.

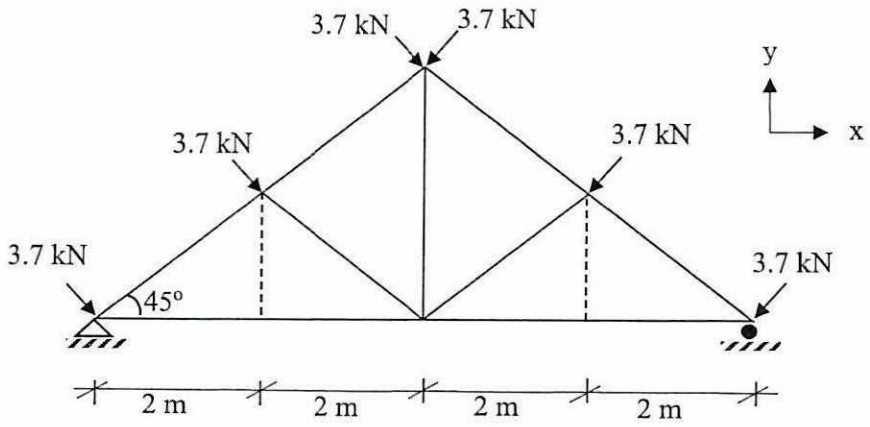


Figure Q3.1

(a) Before the designing process, several important steps need to be completed first.

(i) Resolve the force on the purlin into x and y components relative to the inclined truss members.

(5 marks)

(ii) By using equilibrium equation, calculate the reaction at the supports of the plane truss.

(17 marks)

(iii) Roof truss as shown in **Figure Q3.1** originally designed with pin supports at one end and a roller support at the other end. If the supports were to change to roller supports at both ends, how would this alteration affect the stability of the roof truss.

(3 marks)

(b) An object is thrown vertically from 17.5 m height at speed of 6.5 m/s.

(i) Determine the maximum height of the object can be reached.

(5 marks)

(ii) Determine the time of flight when the object returns to its original location.

(5 marks)

- END OF QUESTIONS -