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# UTHM

Universiti Tun Hussein Onn Malaysia

**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

**FINAL EXAMINATION  
SEMESTER I  
SESSION 2022/2023**

COURSE NAME : STATIC AND DYNAMIC

COURSE CODE : BFC10103

PROGRAMME CODE : BFF

EXAMINATION DATE : FEBRUARY 2023

DURATION : 3 HOURS

INSTRUCTION

1. ANSWER ALL QUESTIONS
2. THIS FINAL EXAMINATION IS CONDUCTED VIA **CLOSED BOOK**
3. STUDENTS ARE **PROHIBITED** TO CONSULT THEIR OWN MATERIAL OR ANY EXTERNAL RESOURCES DURING THE EXAMINATION CONDUCTED VIA CLOSED BOOK

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THIS QUESTION PAPER CONSISTS OF **FOUR (4)** PAGES

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- Q1** (a) **FIGURE Q1(a)** shows three uniform distributed loads of 4kN/m, 6kN/m and 4kN/m are applied to the beam. Sketch free body diagram (FBD) of the beam and calculate the support reactions at A and B. (8 marks)
- (b) Briefly explain the difference between the kinetic and static friction? State the highest friction and the factors that increase friction. (5 marks)
- (c) As shown in **FIGURE Q1(b)**, horizontal force of P is applied on a crate with a mass of 50kg. The coefficient of static friction between the crate and the plane is 0.25. Determine the minimum force P required to hold the crate from sliding down the plane. (12 marks)
- Q2** (a) Elaborate the procedure in determining the centroid for the compound shape in two dimensional. (5 marks)
- (b) **FIGURE Q2(a)(i)** and **Q2(a)(ii)** show beams with T-section and different reference axis of x and y. Prove the position of centroid  $(\bar{x}, \bar{y})$  is located at the same position. (5 marks)
- (c) You have been assigned as design engineer in Berjaya Consultant Sdn. Bhd. The first task you need to approximate the centroid  $(\bar{x}, \bar{y})$  of prestressed concrete section as is shown in **FIGURE Q2(b)**. Given  $h = 672.67\text{mm}$ . All dimensions in unit of mm. (15 marks)
- Q3** (a) Discuss **TWO (2)** importance of moment of inertia to design the structural elements. (10 marks)
- (b) Determine the moment of inertia about the centroidal axis x and y in **FIGURE Q2(b)**. (15 marks)
- Q4** (a) As shown in **FIGURE Q4**, a train is traveling along a straight track with 2 m/s. It starts to accelerate at  $60/v^4 \text{ m/s}^2$ . Determine the velocity (v) and the position 3 seconds after the acceleration. (12 marks)
- (b) Briefly explain the relationship between gravitational potential energy (GPE) and kinetic energy (KE). (6 marks)
- (c) Assume that a 10kg weight was kept at a height of 20 meters above the ground. Now, this block is dropped. Find the velocity of the block just before it hits the ground. (7 marks)

– END OF QUESTIONS –

FINAL EXAMINATION

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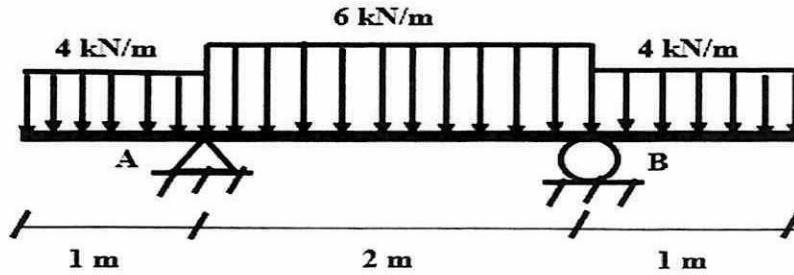


FIGURE Q1(a)

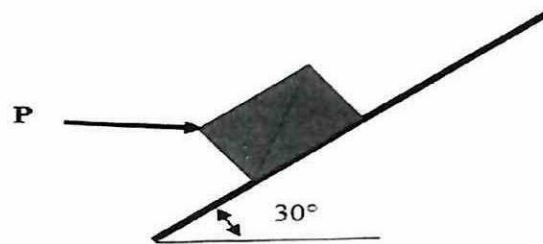


FIGURE Q1(b)

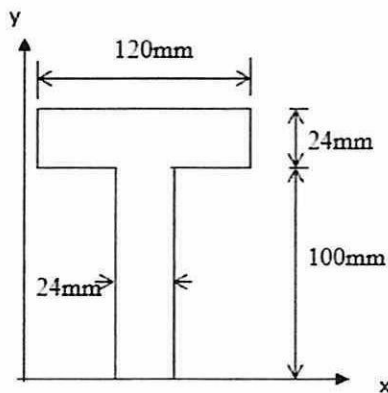


FIGURE Q2(a)(i)

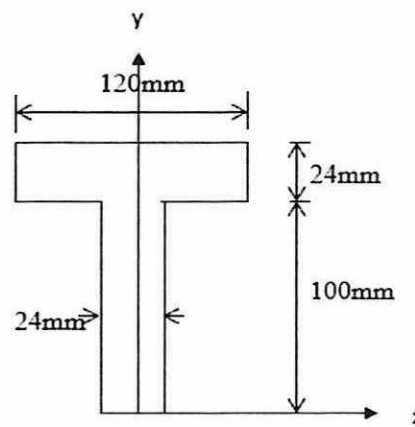


FIGURE Q2(a)(ii)

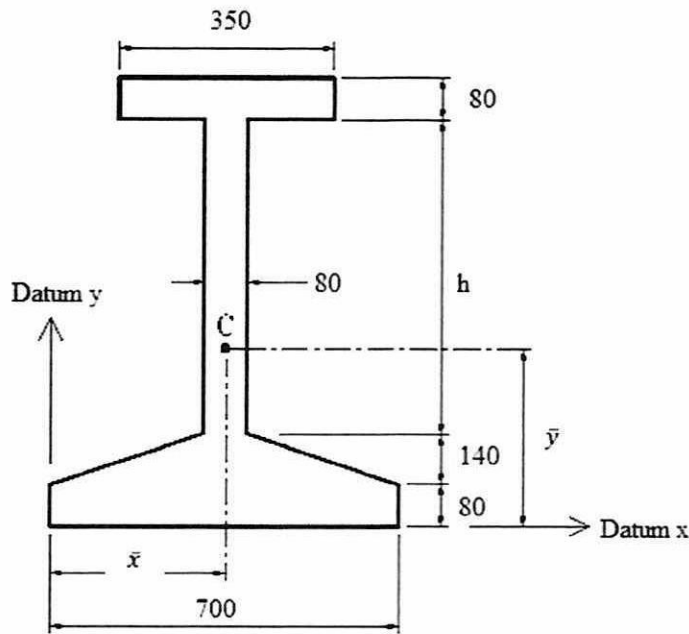
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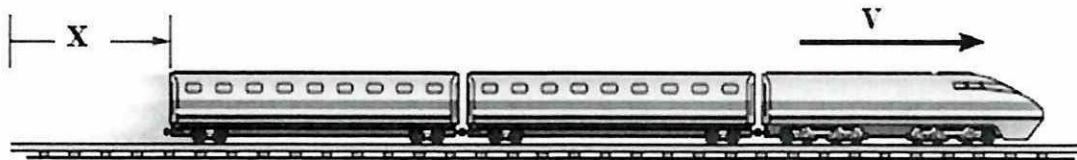
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**FIGURE Q2(b)**



**FIGURE Q4**

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