



# UTHM

Universiti Tun Hussein Onn Malaysia

**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

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

COURSE NAME	:	STATIC AND DYNAMIC
COURSE CODE	:	BFC10103
PROGRAMME CODE	:	BFF
EXAMINATION DATE	:	JULY/AUGUST 2023
DURATION	:	3 HOURS
INSTRUCTION	:	<ol style="list-style-type: none"><li>1. ANSWER <b>ALL</b> QUESTIONS</li><li>2. THIS FINAL EXAMINATION IS CONDUCTED VIA <b>CLOSED BOOK</b></li><li>3. STUDENTS ARE <b>PROHIBITED</b> TO CONSULT THEIR OWN MATERIAL OR ANY EXTERNAL RESOURCES DURING THE EXAMINATION CONDUCTED VIA CLOSED BOOK</li></ol>

THIS QUESTION PAPER CONSISTS OF SEVEN (7) PAGES

**TERBUKA**

- Q1** (a) The simply supported beam is supported triangular uniform load of  $W$  kN/m as shown in **FIGURE Q1(a)**. Determine the reactions at support A and B as a function of uniform load,  $W$ .  
(8 marks)
- (b) A wire lifting sling system as shown in **FIGURE Q1(b)** being used in construction to hoist a steel beam having a mass of 800 kg. The centre of gravity of the steel beam is located at the middle span.
- (i) Determine the maximum tension force in each of the cables AC and BC if  $\theta$  is equal to  $60^\circ$ .  
(8 marks)
- (ii) Determine the length of cables AC and BC that can be used for the lift.  
(2 marks)
- (c) The concrete block has a weight of 400 N with coefficient friction of  $\mu_s$  is equal to 0.2 as shown in **FIGURE Q1(c)**. Determine the minimum applied force of  $P$  to ensure the block is in the verge of impending motion.  
(7 marks)
- Q2** (a) Determine the centre of mass of a particle system as shown in **FIGURE Q2(a)**.  
(6 marks)
- (b) According to composite concrete area shown in **FIGURE Q2(b)**,
- (i) Determine the centroid of the area.  
(15 marks)
- (ii) Locate the position of centroid with aid of sketch and explain the purpose of finding the centroid of concrete's section.  
(4 marks)
- Q3** (a) Define moment of inertia and give TWO (2) examples of its applications.  
(4 marks)
- (b) Determine the centroid of the shaded area as shown in **FIGURE Q3** and draw the centroid location by using sketch diagram.  
(9 marks)
- (c) Compute the moment of inertia about the x-axis and y-axis of the shaded area.  
(12 marks)

- Q4** (a) As shown in **Figure Q4**, a crate with a mass of 20kg is moving up on a slope with angle of  $45^\circ$ . The block at the beginning is in the resting situation and the coefficient of static friction between the crate and the plane is 0.25. If the value of force  $F$  is 200N:
- (i) Draw free body diagram and show all forces on the inclined plane. (2 marks)
  - (ii) Determine acceleration and the velocity of the crate after 4 seconds. (8 marks)
  - (iii) Determine the displacement after 4 seconds. (2 marks)
- (b) Briefly explain the kinetic energy and discuss what happens to kinetic energy when work is done? (3 marks)
- (c) Define the gravitational potential energy and do objects always have gravitational potential energy? (3 marks)
- (d) A soccer ball with a mass of 250 g is kicked directly upward with a velocity of 8 m/s. Determine the height of the ball would achieve. (7 marks)

– END OF QUESTIONS –

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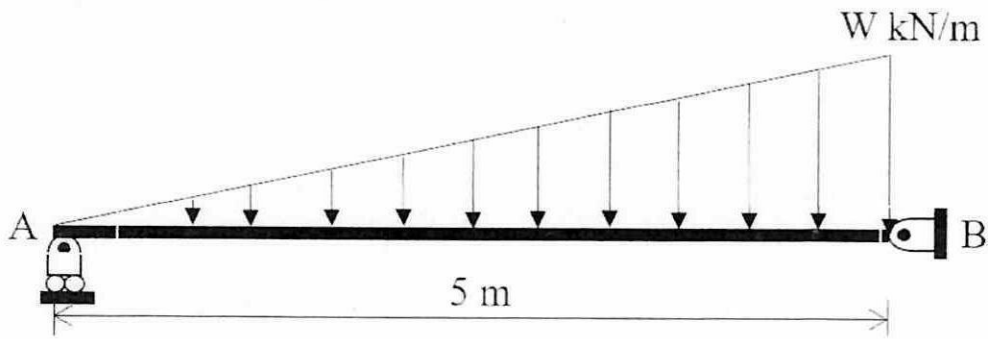


Figure Q1(a)

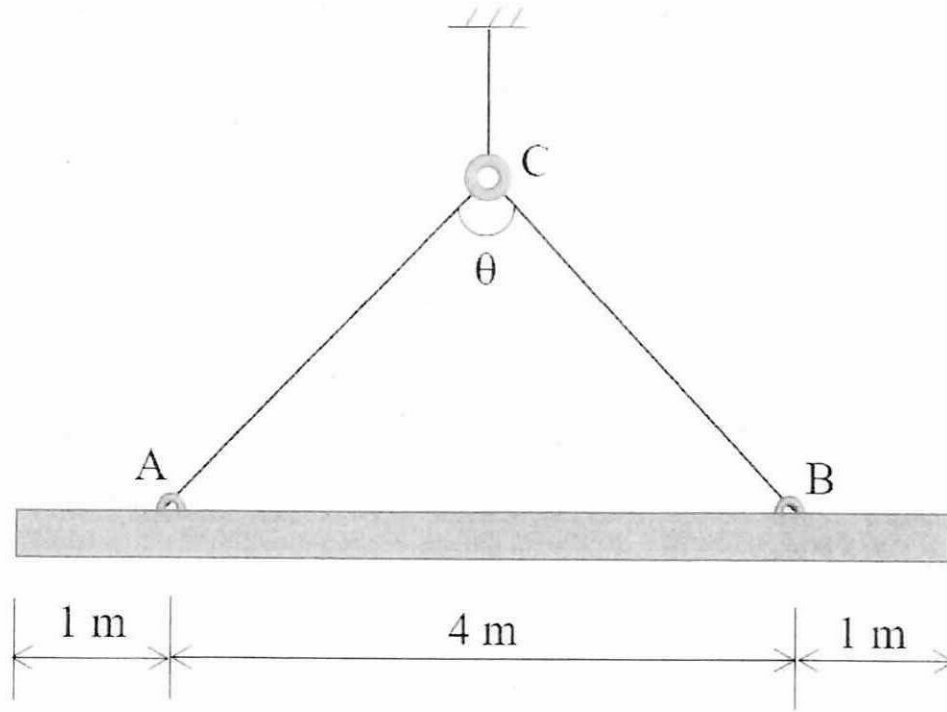


Figure Q1(b)

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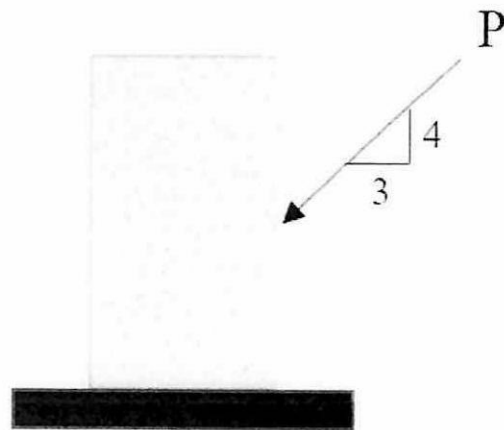


Figure Q1(c)

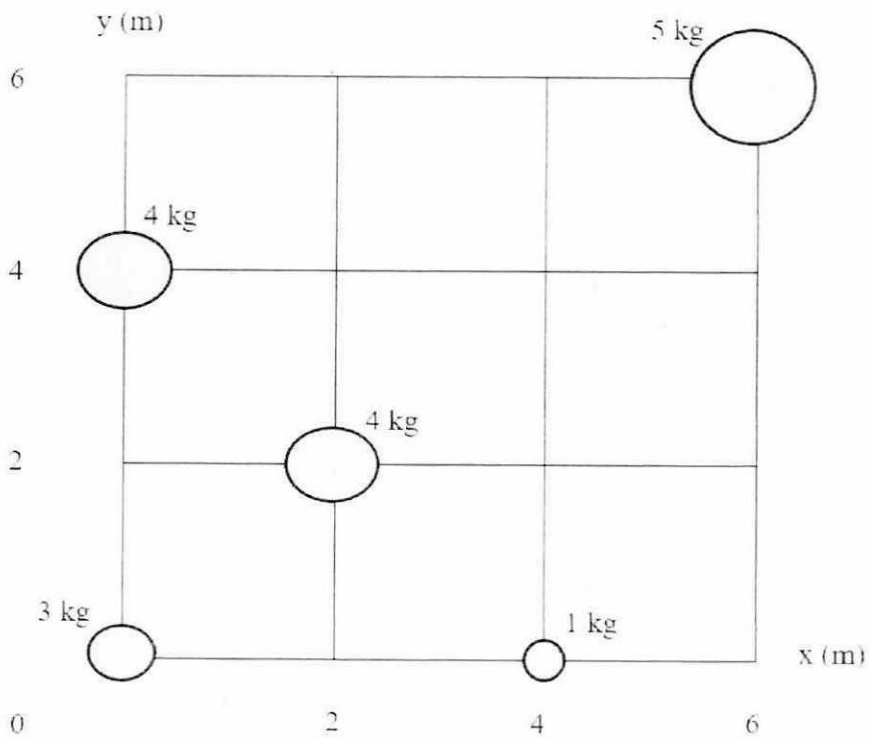


Figure Q2(a)

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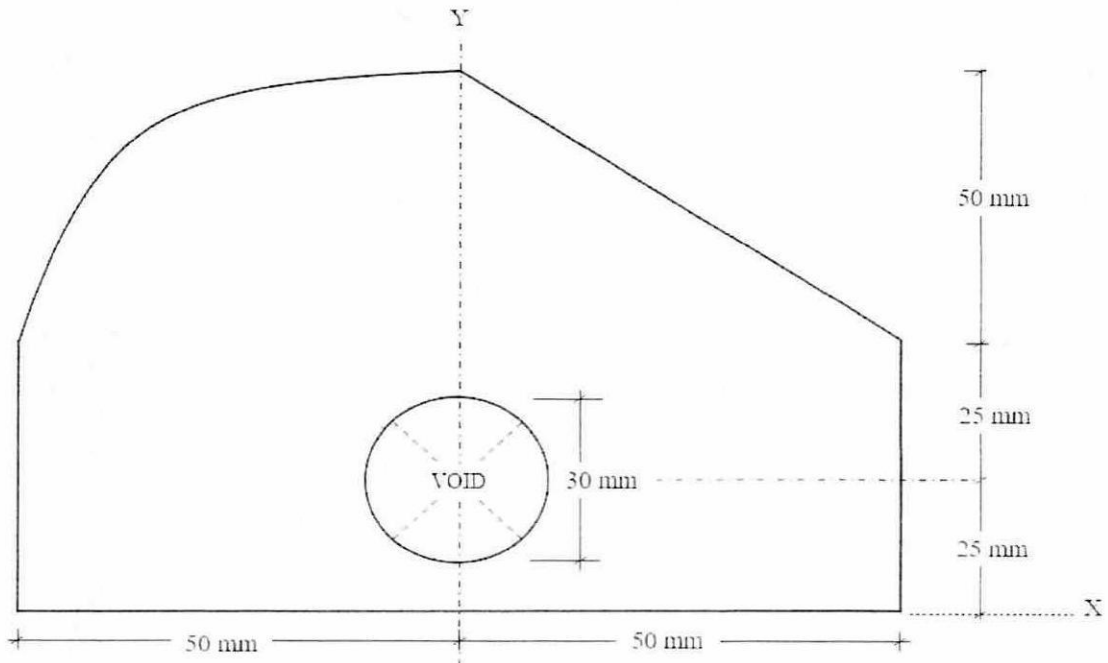
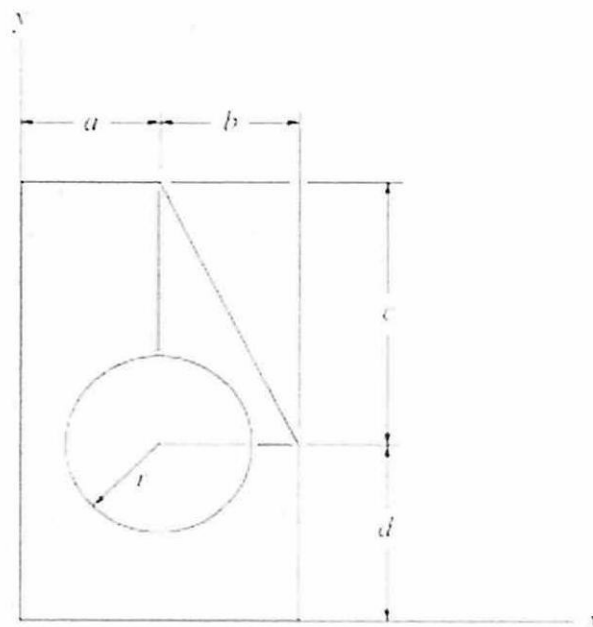


Figure Q2(b)



Where;

$a = 100\text{mm}$

$b = 100\text{mm}$

$c = 150\text{mm}$

$d = 120\text{mm}$

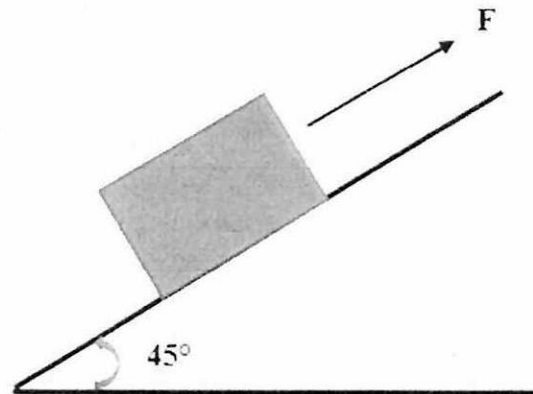
$r = 50\text{mm}$

Figure Q3

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**Figure Q4**