Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2021/2022

COURSE NAME	:	STATICS
COURSE CODE	:	DAM 13403 / DAM 10703
PROGRAMME CODE	:	DAM
EXAMINATION DATE	:	JANUARY / FEBRUARY 2022
DURATION	:	3 HOURS
INSTRUCTION	:	1. ANSWERS **FIVE (5)** QUESTIONS ONLY. 2. THIS FINAL EXAMINATION IS AN **ONLINE ASSESSMENT** AND CONDUCTED VIA **CLOSED BOOK**

THIS QUESTION PAPER CONSISTS OF **NINE (9)** PAGES

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Q1 The bar in **Figure Q1**, supported by a cable at A and a pin at B, carries a triangular distributed load over its right half. Neglecting the weight of the bar,

(i) Draw a free body diagram (FBD) of the bar.

(5 marks)

(ii) Determine the tension at cable A and reaction forces acting at pin B.

(15 marks)

Q2 (a) Briefly explain an expression of positive and negative number in force magnitude value.

(2 marks)

(b) The three structural members, one is in tension while the others in compression, exert the indicated forces on joint A as shown in **Figure Q2(b)**. Determine the magnitude and the direction, measured clockwise from the positive x-axis of the resultant force acting on joint A.

(6 marks)

(c) **Figure Q2(c)** shows the 50 N bucket is supported at D by a system of 4 wires and a spring BC.

(i) Determine the force in each wire and a spring for equilibrium.

(7 marks)

(ii) Determine the unstretched length of spring BC if a force BA cause the angle of 50^0 for equilibrium. Length of wire AB is 2 m and the spring has a stiffness of 40 N/m.

(5 marks)

Q3 (a) Explain briefly the concept of Varignon's Theorem.

(2 marks)

(b) A beam is subjected to the sets of distributed loading as shown in **Figure Q3(b).** Calculate the distributed load, w and dimension, d by assuming both of the resultant force, F_R and couple moment, M_R about point A are zero.

(8 marks)

(c) A structure shown in **Figure Q3(c)** is subjected to the three coplanar forces. Replace this loading by an equivalent resultant force, F_R and specify the location of the resultant's line of action which intersects the column AB and beam BC.

(10 marks)

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Q4 **Figure Q4** shows the part of a roof internal structure.

(a) Draw a free body diagram (FBD) of the truss.

(4 marks)

(b) Determine the magnitude of the reaction forces at supports A and I.

(6 marks)

(c) Using the method of section, determine the forces in members AD, BD and BC of the truss.

(10 marks)

Q5 (a) Briefly state the centre of gravity

(2 marks)

(b) Determine the coordinates of the centroid and the area of the shaded area shown in **Figure 5(b)** by using integration method.

(8 marks)

(c) Locate the centroid (x , y) of the shaded area shown in **Figure 5(c)** by using method of composite areas.

(10 marks)

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Q6 (a) Describes the friction force in the state of dry friction.

(2 marks)

(b) Block A sizes 0.5 m width 0.5 m length and 0.5 m height has a density of 820 kg/m^3 rests over block B which weighs 2000 N as shown in **Figure Q6(b)**. Block A is tied to a wall with a string. If the coefficient of friction between A and B is 0.25 and that between B and the floor is 0.33, determine

(i) Normal force (N) and friction force (F) for both contacted surface.

(4 marks)

(ii) Force in the string tied to the wall force in the string tied to the wall.

(2 marks)

(iii) Value of force P required to create impending motion.

(2 marks)

(c) The 5000 N square block of concrete as shown in **Figure Q6(c)** is adjusted by the 10° wedge under the action of the force P. The coefficient of friction for both wedge surfaces is 0.25 and the coefficient of friction between the block and the horizontal surface is 0.55, determine

(i) Normal force (N) and friction force (F) for wedge and block.

(7 marks)

(ii) Minimum force P required to move the block.

(3 marks)

-END OF QUESTIONS –

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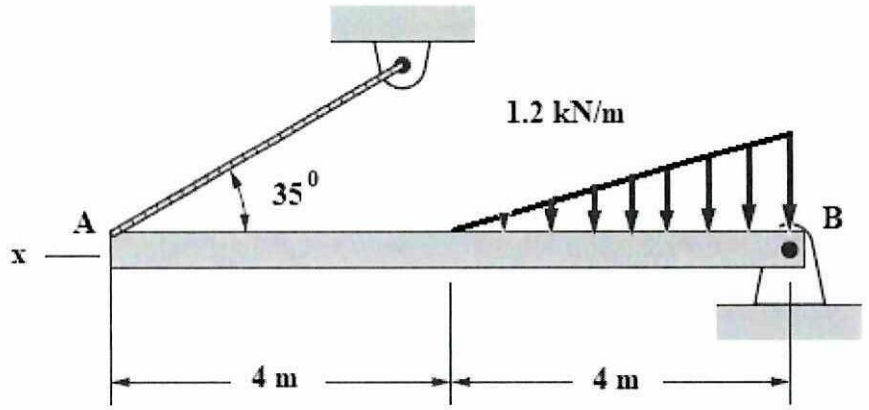

Figure Q1

y

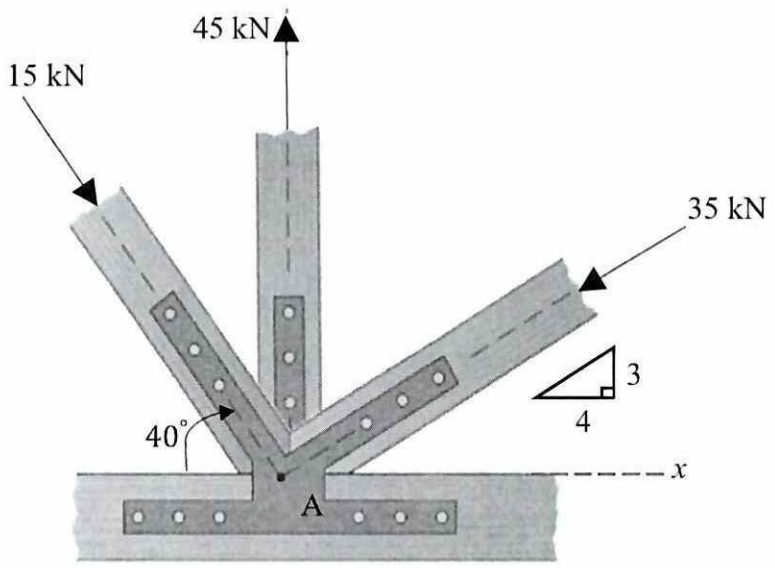

Figure Q2(b)

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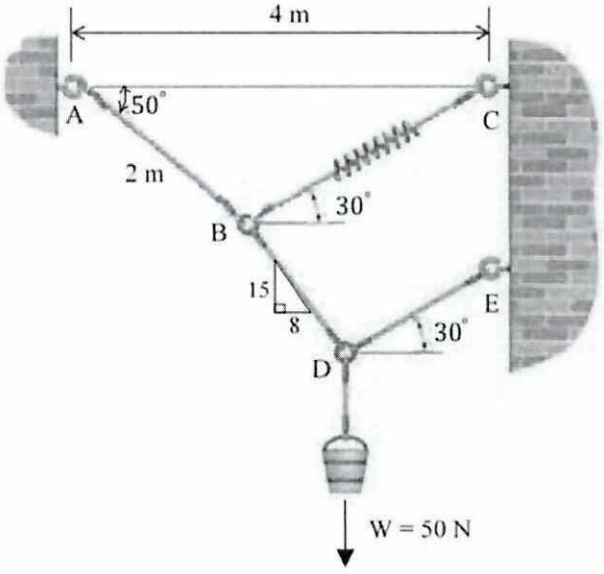

Figure Q2(c)

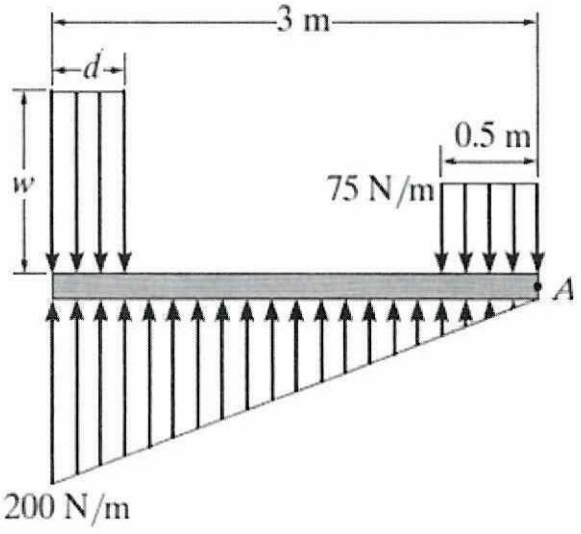

Figure Q3(b)

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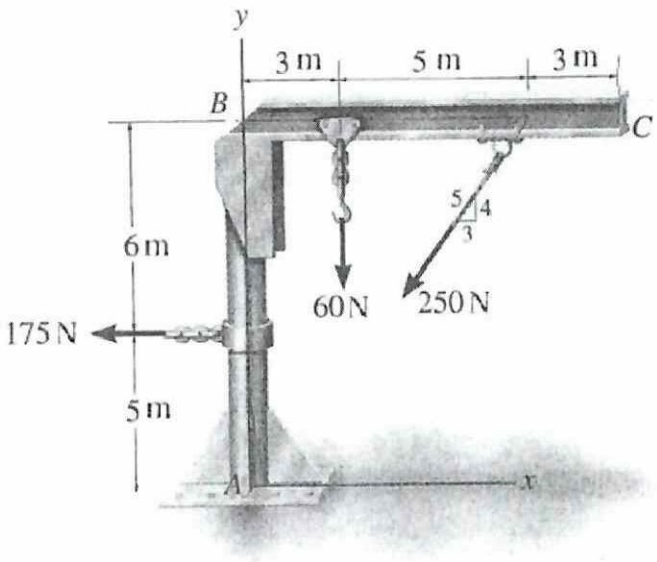

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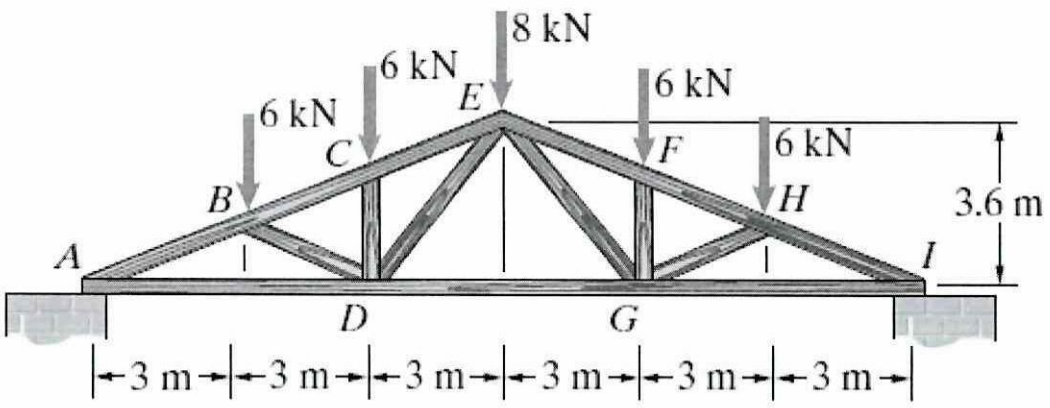

Figure Q4

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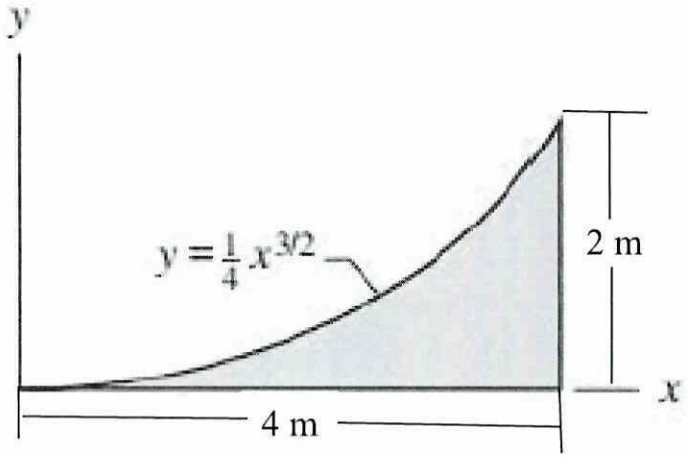

Figure Q5(b)

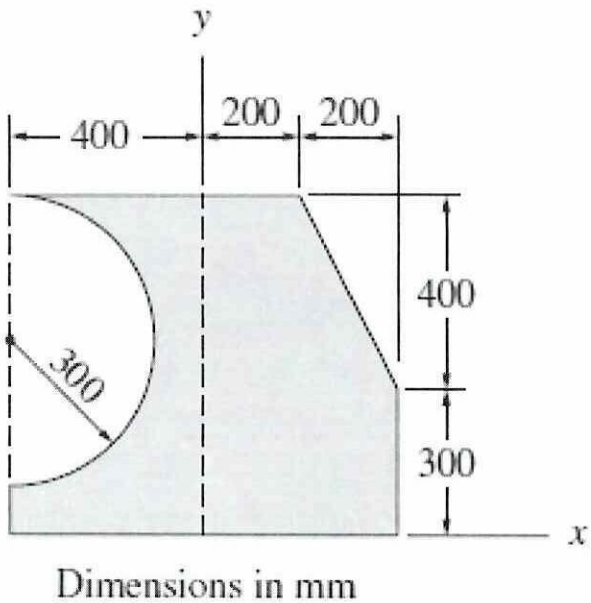

Figure Q5(c)

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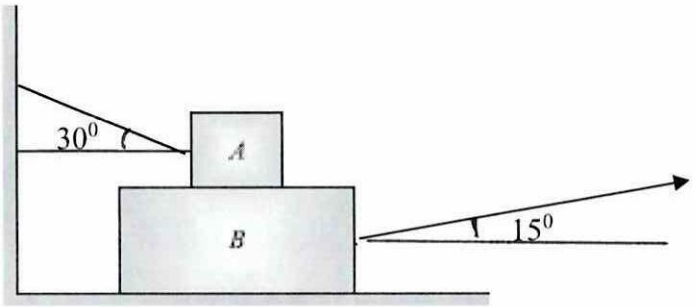

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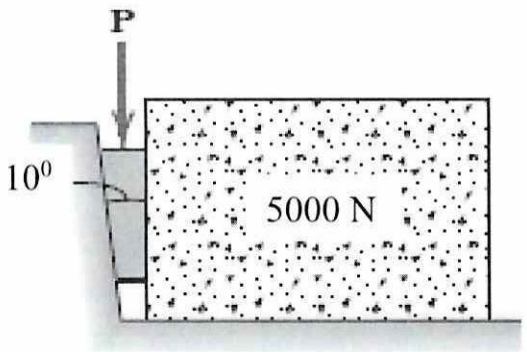

Figure Q6(c)

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