Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
(TAKE HOME)
SEMESTER I
SESSION 2020/2021

COURSE NAME	:	STATICS
COURSE CODE	:	BNP 10102
PROGRAMME CODE	:	BNA / BNB / BNC
EXAMINATION DATE	:	JANUARY/FEBRUARY 2020
DURATION	:	4 HOURS
INSTRUCTION	:	THERE ARE THREE (3) PARTS TO THIS QUESTION. ANSWERS **ALL** QUESTIONS

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

PART 1- MULTIPLE-CHOICE AND TRUE-FALSE QUESTIONS

Instruction: This part consists of **TEN (10)** objective questions. Please read each question carefully and circle the correct answer. Each correctly answered question is worth 1 mark.

1. Following are the equation of equilibrium for the two-dimensional force system, except

a $\sum Fx = 0$
b. $\sum Fz = 0$
c. $\sum Fy = 0$
d $\sum M = 0$

2. Free-body diagrams are used to show all of the internal and external forces act on the structural elements. Select the right rule in drawing a free-body diagram of the body.

i. Clear sketches
ii. Draw in the correct orientation
iii. Show all applied forces and moments, which act on the body
iv. Don't show any internal forces between different parts of the body

a. i & ii
b. i, ii & iv
c. i, ii & iii
d. all above

3. Define the term of equilibrium system.

a. Resultant force acting on the body be equal to zero.
b. Resultant couple moment acting on the body be equal to zero.
c. Resultant force and resultant couple moment acting on the body be equal to zero
d. Resultant force and resultant moment acting on the body be equal to zero.

4. Couple is having a combination of two forces and opposite to each other. They are different in magnitude.

a. True
b. False

5. If the forces acting on the couple are in the same direction that is they are not in the opposite direction as always they are, then?

a. The couple moment will be maximum.
b. The direction of the forces doesn't determine the moment.
c. The couple is not possible
d. No change occurs.

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6. How many reactions acts on pinned, roller and fixed support, respectively.

a. 2,1,3
b. 2,1,2
c. 3,2,1
d. 1,3,2

7. How two equal and oppositely directed forces acting on an object will be in equilibrium?

a. When they are balanced by a third force.
b If they are separated by a distance
c. Only if they act on the same point on the object.
d. When their moments about the same point are equal.

8. The direction of friction force is always to the direction of motion

a. Same
b. Opposite
c. Unchanged
d. None of these

9. Your friend kick a ball, and it stops a few feet from you. What needs to happen to it in order for it to return to your friend?

a. Inertia has to be applied to the ball.
b. Friction has to be applied to the ball.
c. Force has to be applied to the ball.
d. Speed has to be applied to the ball.

10. The point through which the whole weight of the body act is called

a. Centroid
b. Central point
c. Inertial point
d. Center of gravity

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PART 2- UNDERSTANDING AND ABILITY TO APPLY PRINCIPLES AND CONCEPTS

Instruction: This part consists of **TWO (2)** short-answer questions. Please read the question carefully and answer each question in a clear and relevant sentence. Each short-answer question is worth 5 marks.

Q1 Friction is the force that resists motion when the surface of one object comes into contact with the surface of another. Briefly outline **TWO (2)** examples of friction in the real application. State the relevant equation too.

(5 marks)

Q2 With suitable sketches of the relationship of friction force and applied load, briefly explain the concept of friction force.

(5 marks)

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PART 3- ANALYZE AND SOLVE THE PROBLEM RELATED TO THE STATIC STRUCTURAL ELEMENT

Instruction: This part consists of **FOUR (4)** questions. Please answer all questions and show your work clearly and neatly. Each question is worth 20 marks.

Q1 Calculate the external reaction at A and F for the truss loaded as shown in **Figure Q1**. The vertical load represent the effect of the supported roofing material, while the P force represents a wind load. (Note. use variation of force P as stated in **Table Q1**)

(20 marks)

Q2 Analyse the force components acting at the roller A, on the ball and socket B, roller B and the tension on the cord CD as shown in **Figure Q2.** (Note: use variation of force P1 and P2 as stated in **Table Q1**)

(20 marks)

Q3 Determine the weight W is necessary to start the system of blocks shown in **Figure Q3** moving to the right. The coefficient of friction under each block is 0.10 and the pulleys are assumed to be frictionless. (Note: use the value of W1 and W2 as stated in **Table Q1**)

(20 marks)

Q4 Estimate and draw the centroid of the shaded area with respect to the coordinates axes shown in **Figure Q4.** In your analysis, please divide the composite area into three parts as stated in the figure. All units are in mm. (Note: use a distance a, b and c as stated in **Table Q1**)

(20 marks)

– END OF QUESTIONS –

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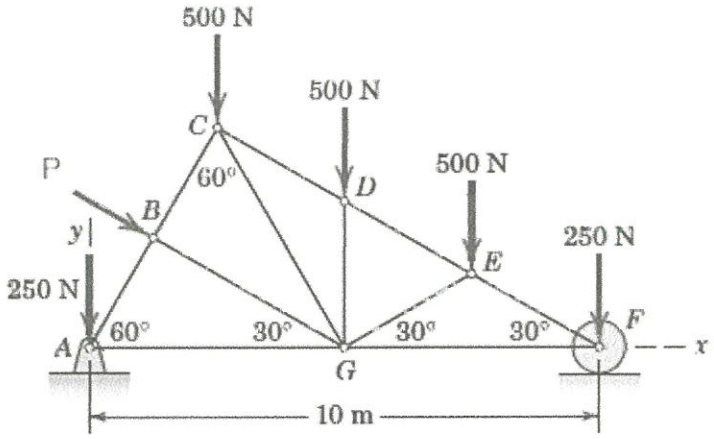

Figure Q1

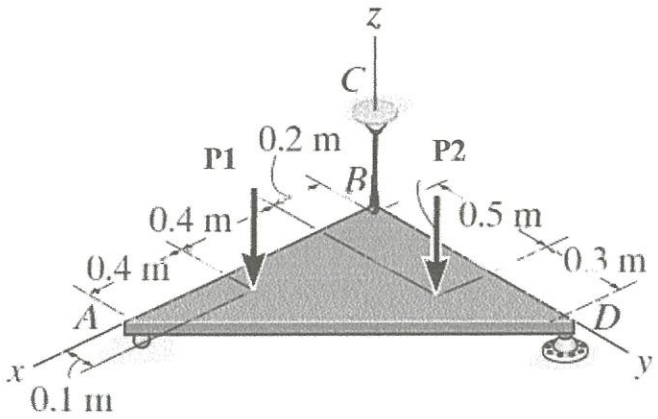

Figure Q2

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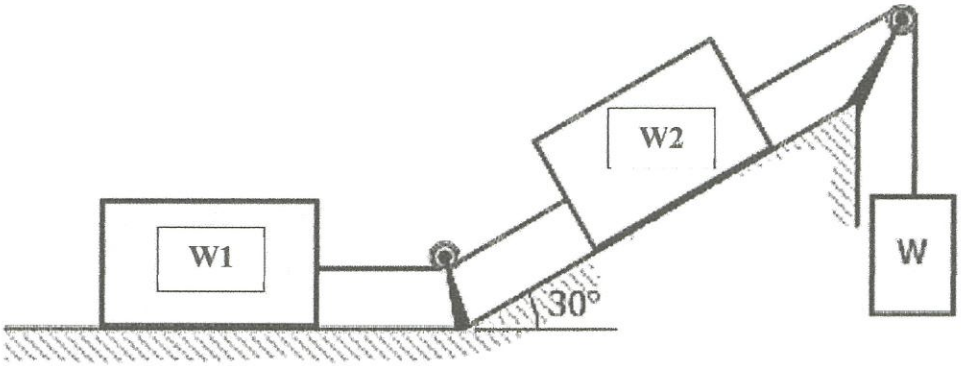

Figure Q3

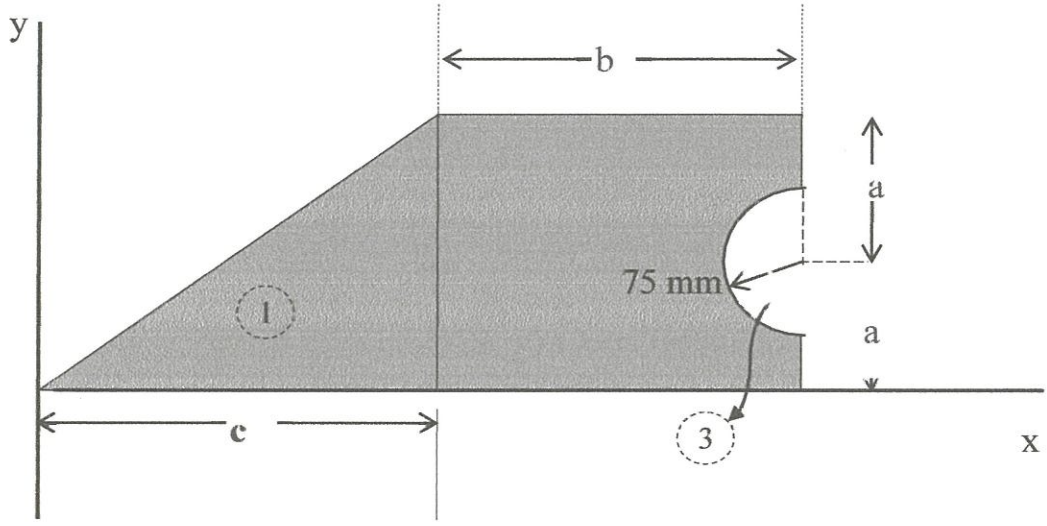

Figure Q4

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Table Q1: Variable for Part 3 (Q1, Q2, Q3 and Q4)

		Force					Distance		
No.	Matrix No.	P (N)	P1 (N)	P2 (N)	W1 (kN)	W2 (kN)	a	b	c
1		200	700	400	40	20	300	200	150
2		210	710	410	45	25	350	250	150
3		220	720	420	50	30	400	300	150
4		230	730	430	55	35	450	350	150
5		240	740	440	60	40	500	200	150
6		250	750	450	65	45	550	250	150
7		260	760	460	70	50	600	300	150
8		270	770	470	75	55	650	350	150
9		280	780	480	80	60	700	400	150
10		290	790	490	85	65	750	500	150
11		300	800	500	90	70	300	250	150
12		310	810	510	95	75	350	200	150
13		320	820	520	100	80	600	400	150
14		330	830	530	105	85	500	300	150
15		340	840	540	110	90	700	350	150
16		350	850	550	115	95	750	350	150
17		360	860	560	120	100	800	500	150
18		370	870	570	125	105	700	250	150
19		380	880	580	130	110	600	300	150
20		390	890	590	135	115	500	350	150
21		400	900	600	140	120	400	200	150
22		410	910	610	145	125	650	250	150
23		420	920	620	150	130	700	300	150
24		430	930	630	155	135	750	350	150
25		440	940	640	160	140	800	400	150
26		450	950	650	165	145	850	500	150
27		460	960	660	170	150	900	500	150
28		470	970	670	175	155	550	350	150
29		480	980	680	180	160	700	200	150
30		490	990	690	185	165	700	250	150
31		500	1000	700	190	170	800	300	150
32		510	1010	710	195	175	700	350	150
33		520	1020	720	200	180	600	200	150
34		530	1030	730	205	185	300	250	150

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