Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
(ONLINE)
SEMESTER II
SESSION 2020/2021

COURSE NAME	:	STATIC AND DYNAMIC
COURSE CODE	:	BFC10103
PROGRAMME CODE	:	BFF
EXAMINATION DATE	:	JULY 2021
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

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

Q1 (a) A plate girder is held in a horizontal position by two cables as shown in **FIGURE Q1(a)**. Knowing that the weight of box at O is 30 kg, determine an equivalent resultant force and moment about point B when $\alpha = 40^0$.

(10 marks)

(b) A flagpole with height of 6.0 m is stabilized by two cables as shown in **FIGURE Q1(b)**. Determine the resultant moment produced by the forces about point O.

(15 marks)

Q2 A 10 m long ladder with mass of 20 kg rests against a smooth wall at height of 8 m at an inclination α to the rough ground floor. Assuming that there is no friction between the wall and the ladder, but there is a frictional force between the floor and the ladder.

(a) Determine the minimum static coefficient of friction, μ_s between the floor and the ladder for which equilibrium is possible.

(8 marks)

(b) A worker of mass 80 kg climbs up the ladder. Determine how far the worker may go up before the ladder starts to slip.

(12 marks)

(c) By comparing between frictional force of floor and wall, determine whether a worker can climb safely to the top of the ladder or not.

(5 marks)

Q3 (a) **FIGURE Q3** shows a composite structure with different weight densities. Given the density of concrete is 2400 kg/m^3, density of steel is 8000 kg/m^3 and thickness of the structure is 1000 mm. Determine and locate the centroid of mass for this structure.

(12 marks)

(b) Calculate the moment inertia of the composite structure in **FIGURE Q3** with respect to x-axis by ignoring its thickness.

(13 marks)

Q4 (a) Briefly explain the relationship between gravitational potential energy (GPE) and kinetic energy (KE).

(6 marks)

(b) A car is moving at 15 m/s and begin to accelerate at a m/s^2, where $v = \sqrt[4]{(60/a)}$ m/s.

(i) Calculate the acceleration a and position of the car at 5 seconds after the acceleration.

(13 marks)

(ii) Knowing that the drag resistance on the car due to the wind is FD = (10v) N, where v is the velocity, determine the power supply to the engine at this instant. The mass of car is 1000 kg and the engine has a running efficiency of $\varepsilon = 0.6$.

(6 marks)

- **END OF QUESTIONS –**

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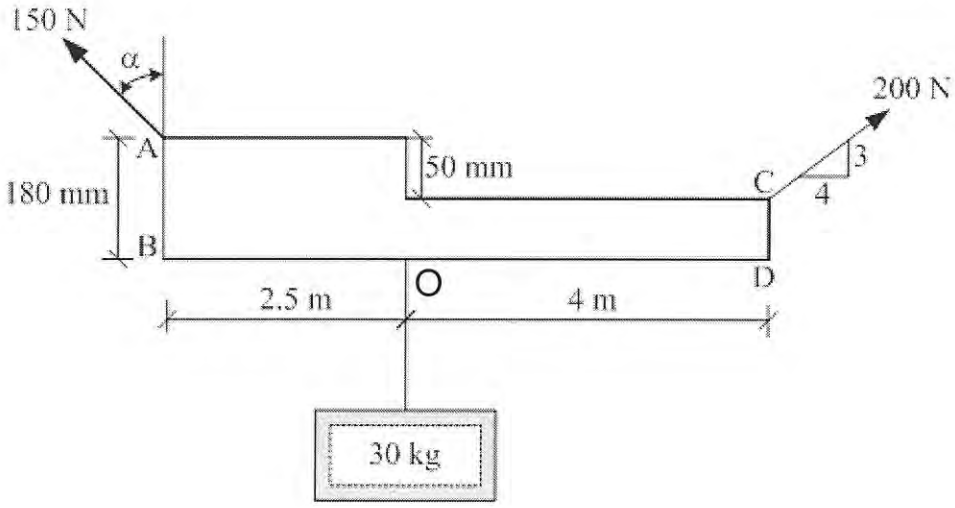

FIGURE Q1(a)

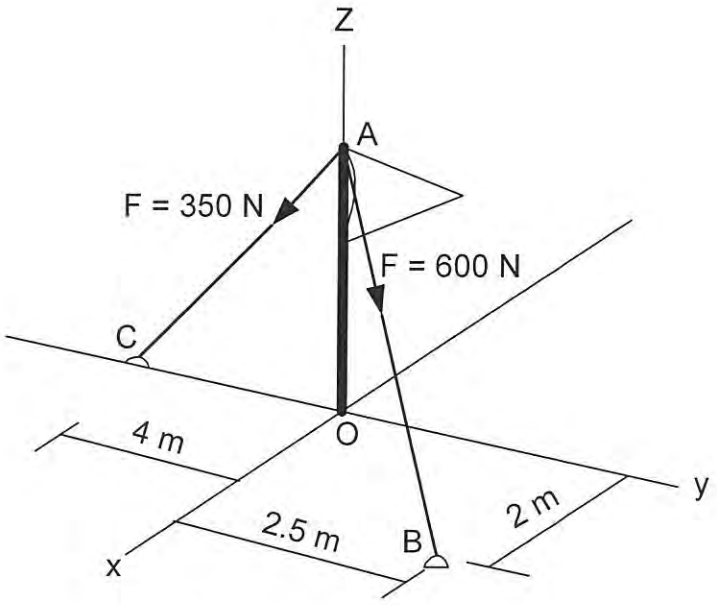

FIGURE Q1(b)

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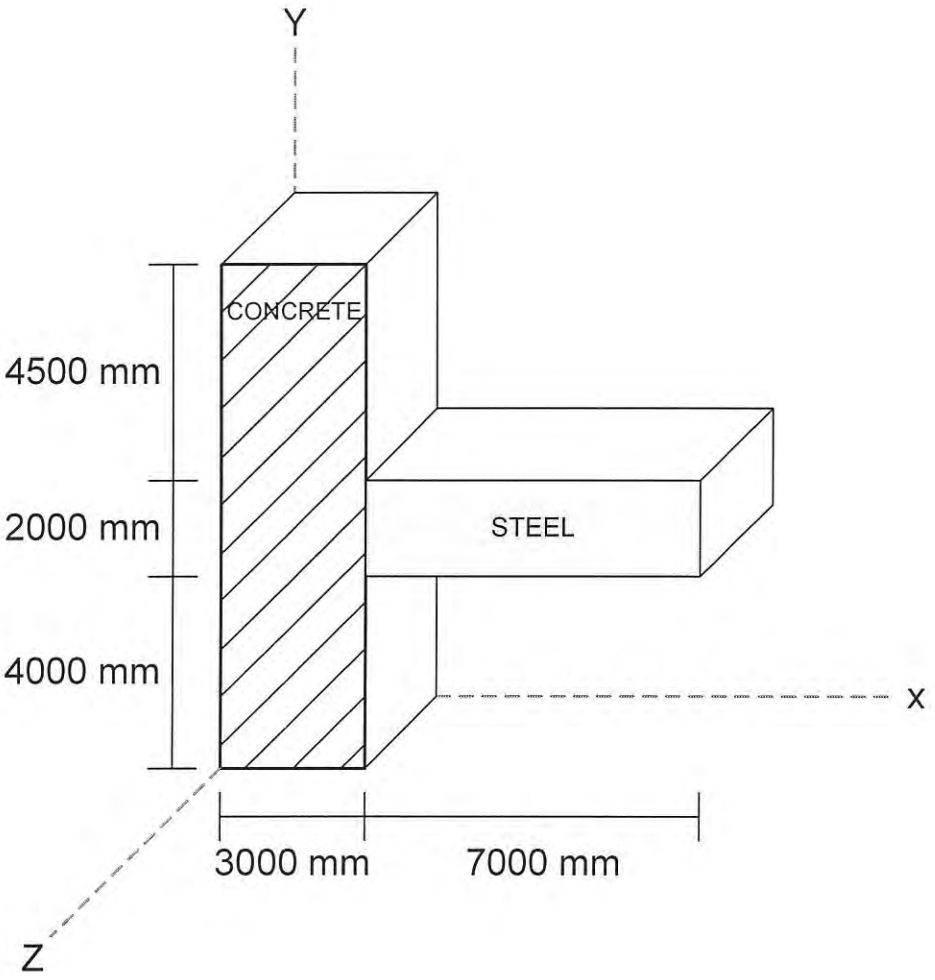

FIGURE Q3