UNIVERSITI TEKNOLOGI PETRONAS

FINAL EXAMINATION
MAY 2024 SEMESTER

COURSE	:	**PEB1073/PFB1073 - STATICS AND DYNAMICS**
DATE	:	**6 AUGUST 2024 (TUESDAY)**
TIME	:	**9:00 AM - 12:00 NOON (3 HOURS)**

INSTRUCTIONS TO CANDIDATES

1. Answer **ALL** questions in the Answer Booklet.

2. Begin **EACH** answer on a new page in the Answer Booklet.

3. Indicate clearly answers that are cancelled, if any.

4. Where applicable, show clearly steps taken in arriving at the solutions and indicate **ALL** assumptions, if any.

5. **DO NOT** open this Question Booklet until instructed.

Note :

i. There are **FIVE (5)** pages in this Question Booklet including the cover page .

ii. **DOUBLE-SIDED** Question Booklet.

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1. a. Define these terms in Statics and Dynamics context:

    i. Particle

    [3 marks]

    ii. Rigid Body

    [3 marks]

    b. A flagpole was placed in front of Malaysian Embassy in Japan. Cable
        AB and AC are used to support the flagpole as shown in **FIGURE Q1**.
        Determine the magnitude of the resultant force if F_B = 560 N and F_C is
        700 N and find the coordinate direction angles of the resultant force
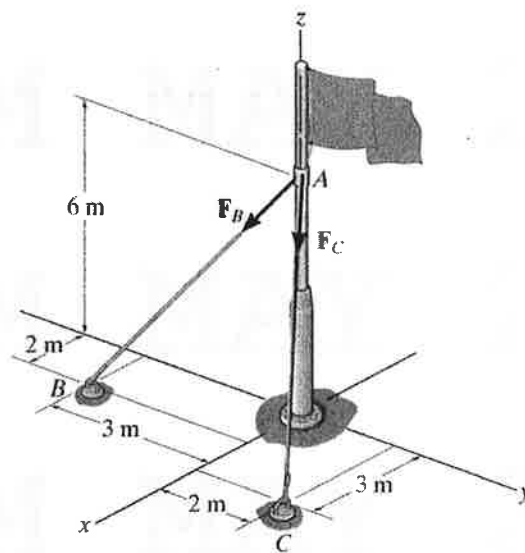   acting on the flagpole.

FIGURE Q1: A flagpole

[18 marks]

2.   a.   Differentiate between fluid friction and Coulomb friction in terms of their definition and state **ONE (1)** application each.

[6 marks]

b.   Darris tried to move a Determine the minimum mass for Darris to enable him to move the crate if the coefficient of static friction between his shoes and the floor is $\mu_s = 0.45$ and between the crate and the floor is $\mu_c = 0.2$. Assume that Darris only exerts a horizontal force on the crate. uniform crate that has a mass of 150 kg as shown in **FIGURE Q2**.
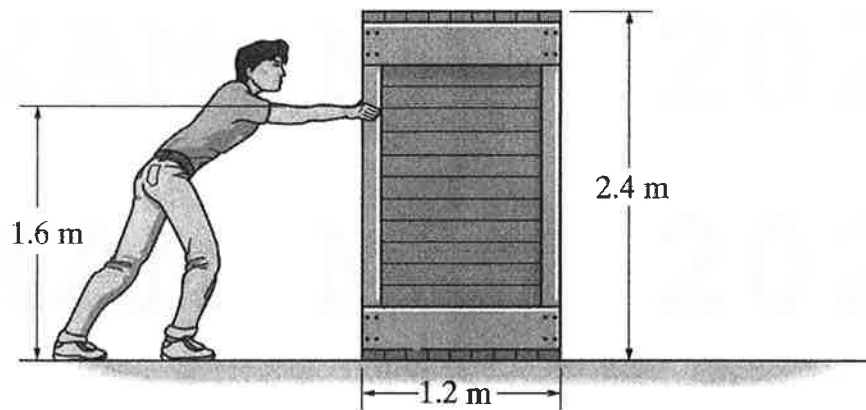

FIGURE Q2: Crate mover

[20 marks]

3. a. Zahin has come up with a brilliant way to install a 10 kg lamp in his bedroom to save space as shown in **FIGURE Q3**. The lamp has a center of mass at G. Determine the horizontal and vertical components of reaction at A and the force in the cable BC.
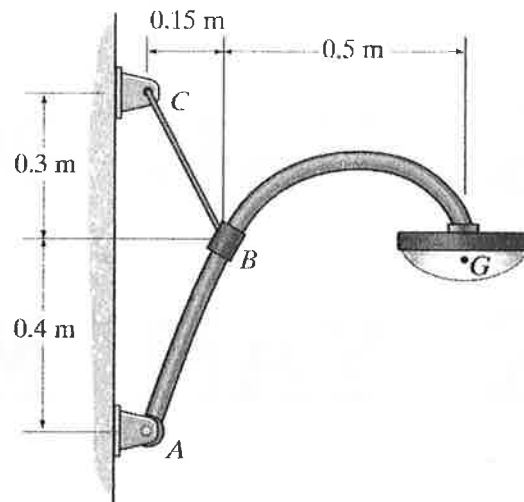

FIGURE Q3a: A wall-mounted lamp

[16 marks]

b. The 20-N horizontal force acts on the handle of the socket wrench. Determine the moment of this force about point B. Specify the coordinate direction angles α, β, γ of the moment axis.
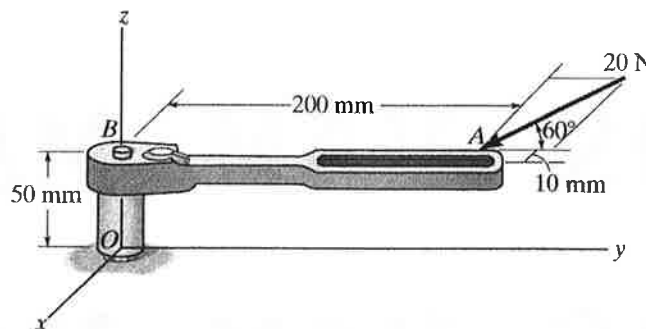

FIGURE Q3b: A socket wrench

[10 marks]

4

4. Two cars start from rest side by side at the R&R Gurun and travel along a straight road from Gurun to Kuala Kangsar. Proton Saga accelerates at 4 m/s^2 for 10 s and then maintains a constant speed. Perodua Bezza accelerates at 5 m/s^2 until reaching a constant speed of 25 m/s and maintains this speed.

    a. Construct the a-t, v-t and s-t graphs for each car until $t = 15$ s.

    [18 marks]

    b. Determine the distance between the two cars when $t = 15$ s.

    [6 marks]

- END OF PAPER -