



UTHM

Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION SEMESTER II SESSION 2022/2023

COURSE NAME : STATICS

COURSE CODE : BDJ 10203

PROGRAMME CODE : BDJ

EXAMINATION DATE : JULY/AUGUST 2023

DURATION : 3 HOURS

INSTRUCTION : 1. ANSWER **FIVE (5)** QUESTIONS **ONLY**
2. THIS FINAL EXAMINATION IS CONDUCTED VIA **CLOSED BOOK.**
3. STUDENTS ARE PROHIBITED TO CONSULT THEIR OWN MATERIAL OR ANY EXTERNAL RESOURCES DURING THE EXAMINATION CONDUCTED VIA CLOSED BOOK

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

TERBUKA

- Q1** (a) **Figure Q1(a)** shows a ball at D is supported by using several cables which are in equilibrium state. The ball D has a mass of 20 kg. If a force of $F = 100$ N is applied horizontally to the ring at A , determine the largest dimension d so that the force in cable AC is zero. (7 marks)
- (b) **Figure Q1(b)** shows a crate with a total weight of 100 kg. This equilibrium system is supported by three cables which are AB , AC and AD .
- (i) Draw a free body diagram of the system. (3 marks)
- (ii) Represent each of the forces on the free body diagram in Cartesian vector form. (4 marks)
- (iii) Calculate the force in the supporting cables which are F_{AB} , F_{AC} and F_{AD} . (6 marks)
- Q2** (a) Define the concept of a couple moment. (2 marks)
- (b) **Figure Q2(b)** shows an arch pole supported by a chain BC . The chain BC exerted a force of 600N.
- (i) Calculate the force unit vector, μ_{BC} and its force, F_{BC} in Cartesian vector. (10 marks)
- (ii) Calculate the moment of force F_{BC} about point A in Cartesian vector. (4 marks)
- (iii) Calculate r_{OB} and magnitude of the moment of the x -axis using triple scalar product. (4 marks)

- Q3** (a) **Figure Q3(a)** shows a post fixed at point A . Calculate an equivalent resultant force, F_R and its angle, θ of the force system acting on the post. Finally specify the resultant's force line of action, d intersects on member AB , measured from point A . (7 marks)
- (b) **Figure Q3(b)** shows the smooth pipe rests against the opening at the points of contact A , B , and C . By neglecting the pipe's thickness in the calculation,
- (i) Draw a free body diagram (FBD) of the pipe. (3 marks)
- (ii) Calculate the reaction force acting at contact points of A , B and C needed to support the force of 300 N. (10 marks)
- Q4** (a) Define zero force members in simple trusses model. (2 marks)
- (b) Determine the force in each member of truss and state if the members are in tension (T) or compression (C). Set $P = 8\text{kN}$. The trusses are illustrated as in **Figure Q4(b)**.
- (i) Calculate the force in member DC and DE at joint D . (5 marks)
- (ii) Calculate the force in member CE and CB at joint C . (5 marks)
- (iii) Calculate the force in member BE and BA at joint B . (5 marks)
- (iv) Calculate the force in member EA at joint E . (3 marks)

- Q5** (a) **Figure Q5(a)** shows the wall crane supports a load of 400 N. The bar *ABC* has a weight of 70 N and member *BD* has a weight of 20 N. Each member is uniform and has a center of gravity at its center.
- (i) Draw free body diagram (FBD) of pulley *E*, bar *ABC* and *BD*. (5 marks)
 - (ii) Calculate the force in the cable at the motor *W* and the reaction force at pin *A*, *B* and *D*. (9 marks)
- (b) **Figure Q5(b)**, shows the uneven plate. Determine the location (x_c, y_c) of the plate centroid by using method of composite bodies (6 marks)
- Q6** (a) State the definition of dry friction, give **ONE (1)** example of its use, and draw the free body diagram for it. (4 marks)
- (b) **Figure Q6(b)** shows a man try to pushes a crate horizontally. The coefficient of static friction between the 450 lb crate and the ground is $\mu_s = 0.3$ and between his shoes and the floor is $\mu'_s = 0.6$, while the man weight is 200 lb.
- (i) Draw the free body diagram of the crate and the man separately. (4 marks)
 - (ii) Calculate the minimum force, *P* and distance, *x* (between the crate weight, W_c and crate normal force, N_c) by assuming that the crate slides before tipping. (10 marks)
 - (iii) Determine the maximum force that the man can produce and decide whether he is able to move the crate or not. (2 marks)

-END OF QUESTIONS -

FINAL EXAMINATION

SEMESTER / SESSION : SEM II / 2022/2023

PROGRAMME CODE : BDJ

COURSE NAME : STATICS

COURSE CODE : BDJ 10203

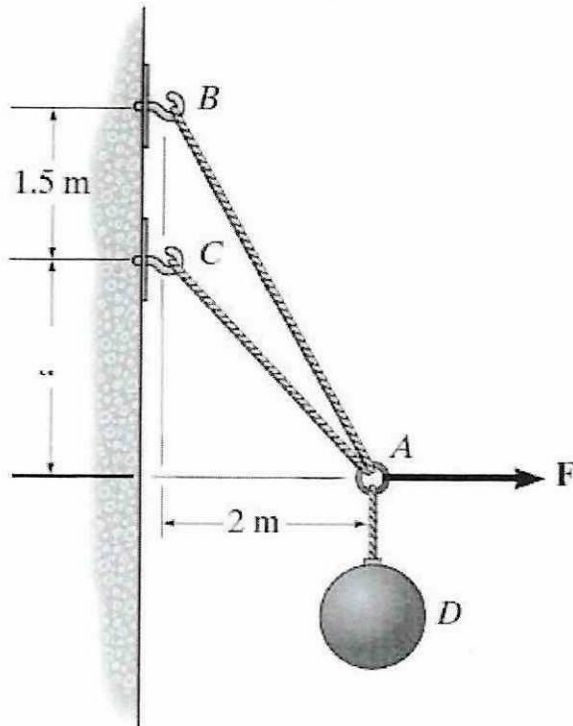


Figure Q1(a)

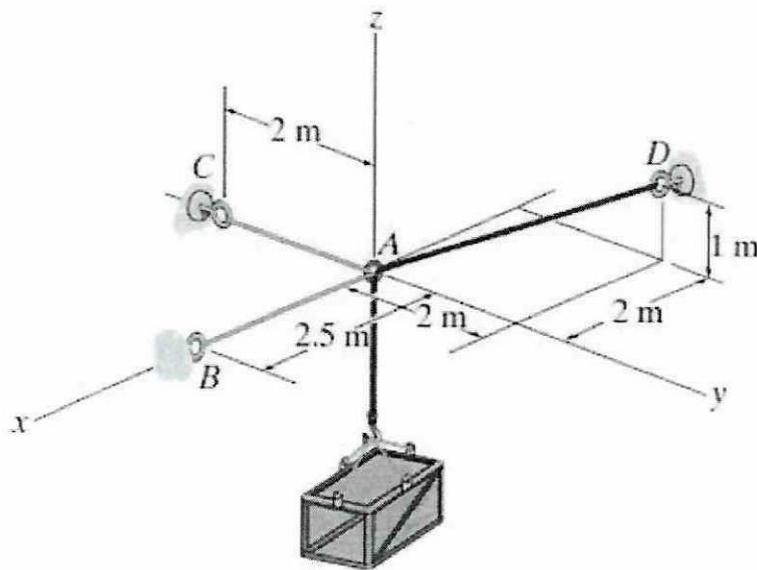


Figure Q1(b)

FINAL EXAMINATION

SEMESTER / SESSION : SEM II / 2022/2023

PROGRAMME CODE : BDJ

COURSE NAME : STATICS

COURSE CODE : BDJ 10203

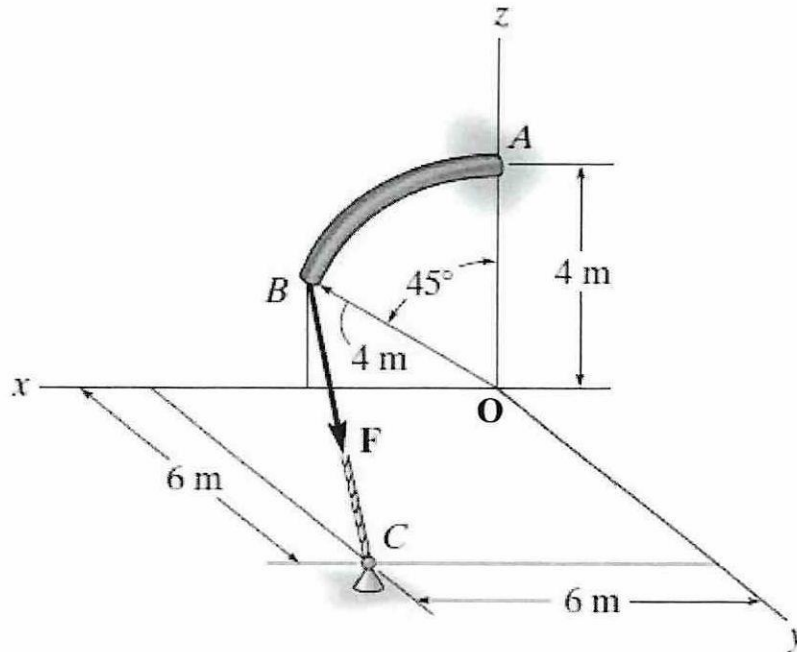


Figure Q2(b)

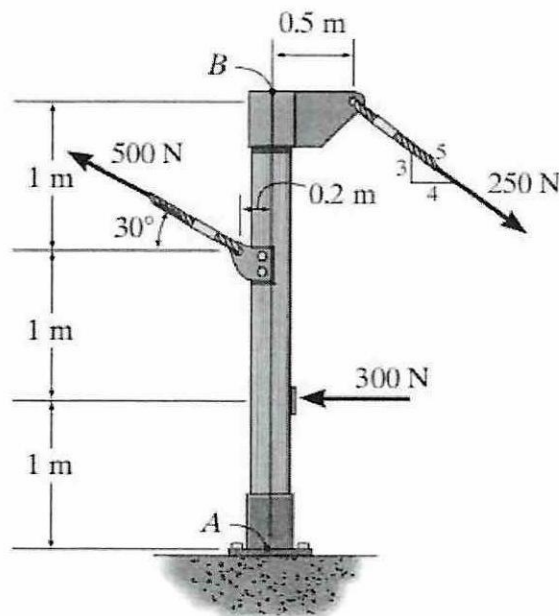


Figure Q3(a)

FINAL EXAMINATION

SEMESTER / SESSION : SEM II / 2022/2023

PROGRAMME CODE : BDJ

COURSE NAME : STATICS

COURSE CODE : BDJ 10203

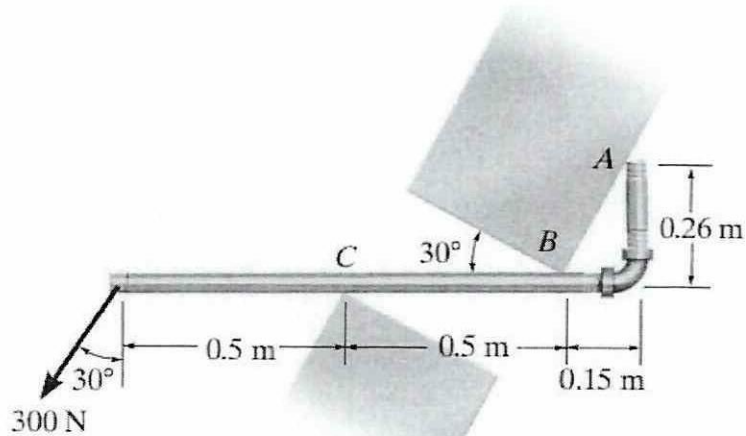


Figure Q3(b)

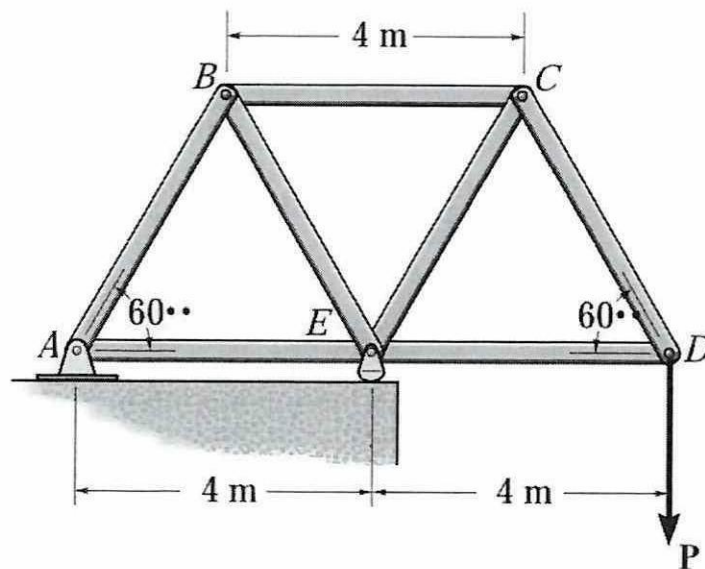


Figure Q4(b)

FINAL EXAMINATION

SEMESTER / SESSION : SEM II / 2022/2023

PROGRAMME CODE : BDJ

COURSE NAME : STATICS

COURSE CODE : BDJ 10203

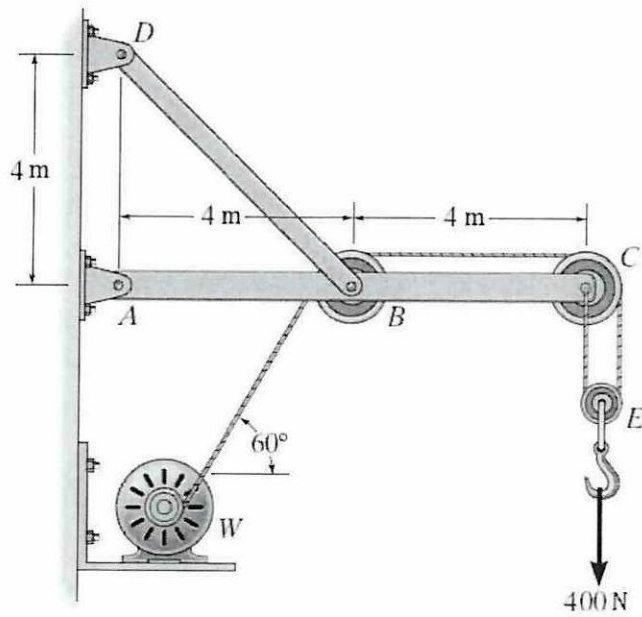


Figure Q5(a)

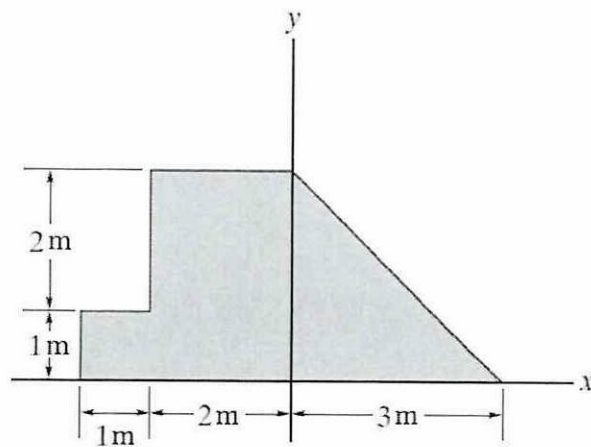


Figure Q5(b)

FINAL EXAMINATION

SEMESTER / SESSION : SEM II / 2022/2023

PROGRAMME CODE : BDJ

COURSE NAME : STATICS

COURSE CODE : BDJ 10203

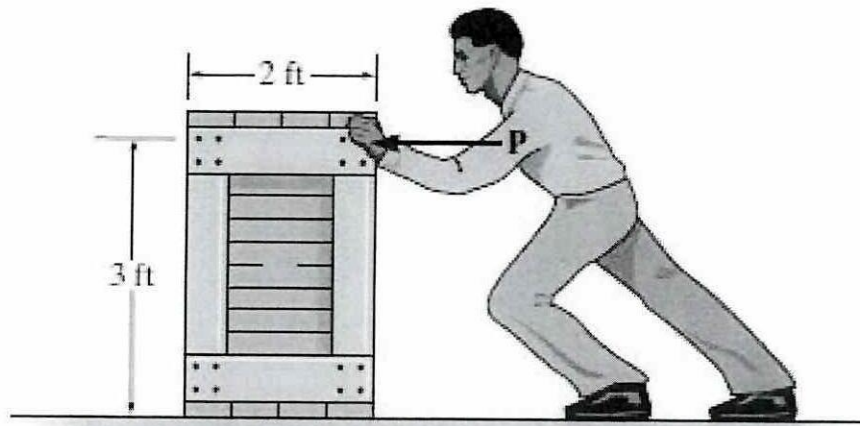


Figure Q6(b)