INTI INTERNATIONAL UNIVERSITY

FOUNDATION PROGRAMME (SCIENCE)
(CFSI)
EGR 1203: ENGINEERING MECHANICS
FINAL EXAMINATION: MAY 2014 SESSION (5P1)

Instructions: This paper consists of **FIVE (5)** questions. Answer any **FOUR (4)** questions in the answer booklet provided. All questions carry equal marks.

Question 1

(a) Two forces are applied to an eye bolt fastened to a beam as shown in Figure Q1(a). Determine

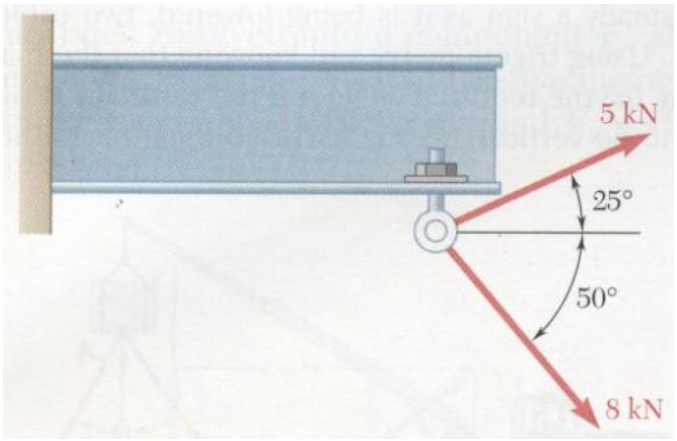

Figure Q1(a)

(i) the magnitude and direction of their resultant, and

(3 marks)

(ii) draw the parallelogram.

(3 marks)

(b) Two traffic signals are temporarily suspended from a cable as shown in Figure Q1(b). Knowing that the signal at B weighs 300 N, determine the weight of the signal at *C*.

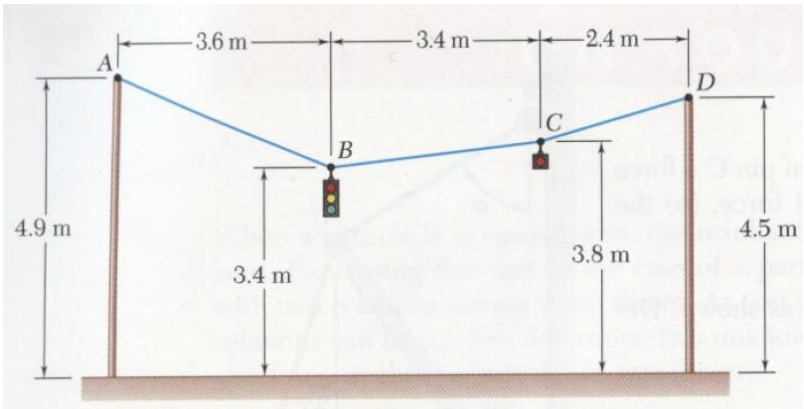

Figure Q1(b)

(8 marks)

(c) As shown in Figure Q1(c), determine the force in each member of the truss using the method of joint. State whether each member is in tension or compression.

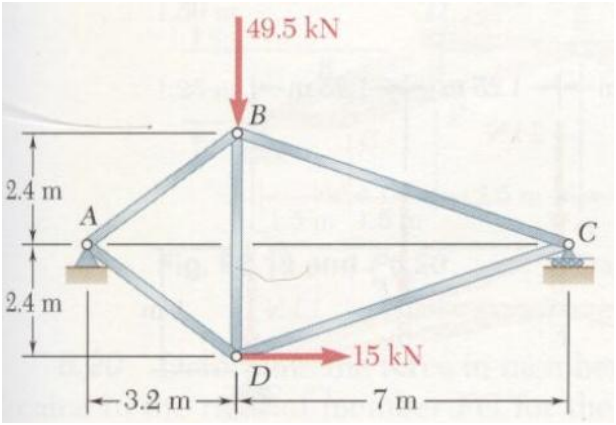

Figure Q1(c)

(11 marks)

Question 2

(a) Determine the magnitude and direction of the resultant for the two forces shown in Figure Q2(a). It is known that P = 4 kN and Q = 8 kN.

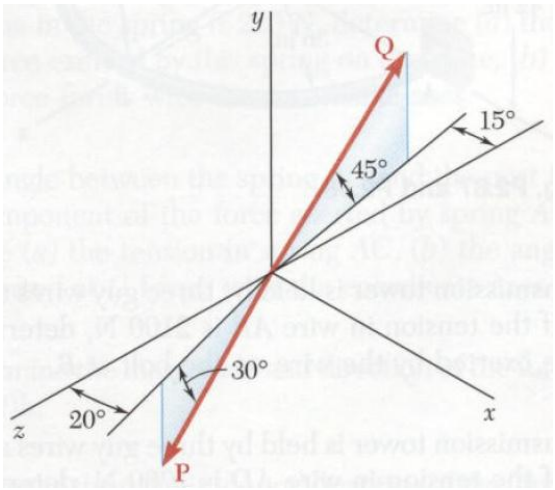

Figure Q2(a)

(15 marks)

(b) A 100 kg stone as shown in Figure Q2(b) is originally at rest on the smooth horizontal surface. If a towing force of 200 N, acting at an angle of 45°, is applied to the stone for 10 s, determine

(i) the final velocity, and

(2 marks)

(ii) the normal force which the surface exerts on the stone during this time interval.

(2 marks)

Figure Q2(b)

(c) Determine the internal force, shear force and the bending moment acting at point B of the two-member frame as shown in Figure Q2(c).

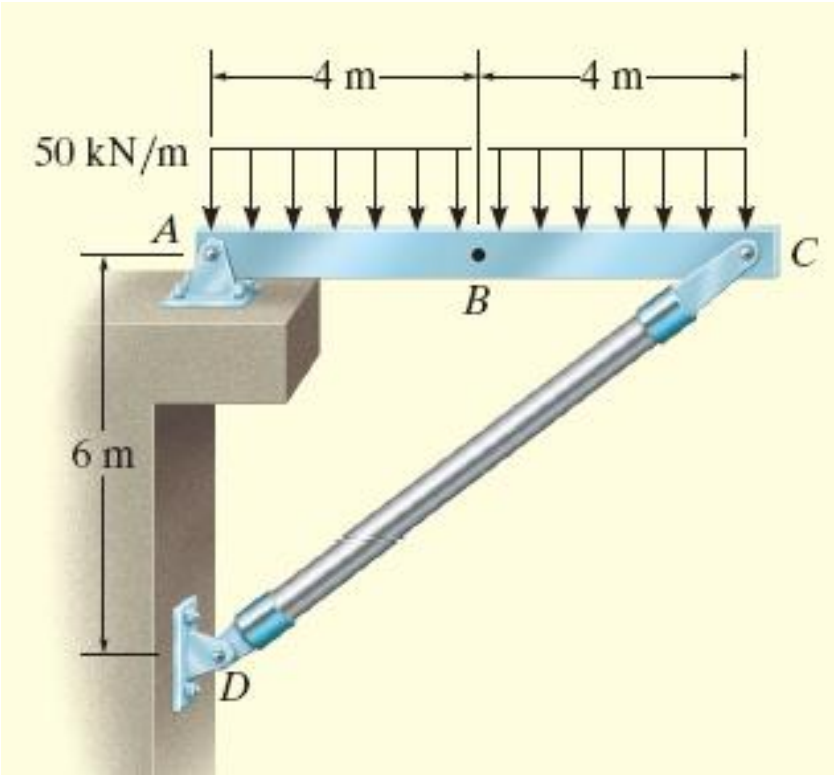

Figure Q2(c)

(6 marks)

Question 3

(a) For the three forces shown in Figure Q3(a), determine

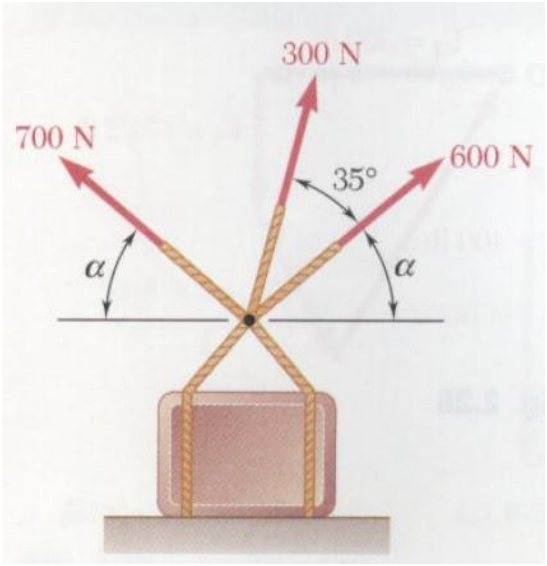

Figure Q3(a)

(i) the required value of α if the resultant is vertical, and

(5 marks)

(ii) the corresponding magnitude of the resultant force.

(4 marks)

(b) Referring to Figure Q3(b), a uniform plate grider weighing 6000 kg is held in a horizontal position by two crane cables as shown. Determine

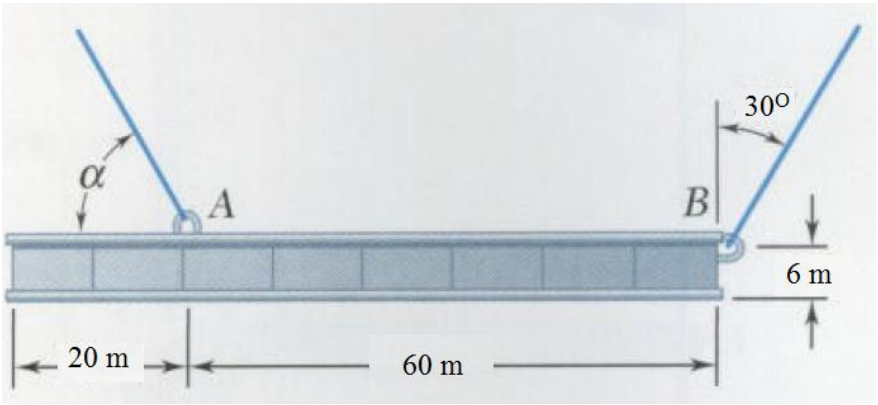

Figure Q3(b)

(i) the angle α, and

(2 marks)

(ii) the tension in each cable.

(5 marks)

(c) The particle travels along a straight line with the velocity described by the Figure Q3(c). Construct the *a*-*s* graph.

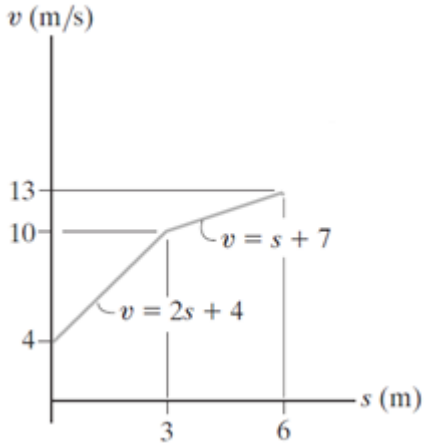

Figure Q3(c)

(9 marks)

Question 4

(a) A sign is suspended from two chains *AE* and *BF*. The tension in *BF* is 200 N, determine

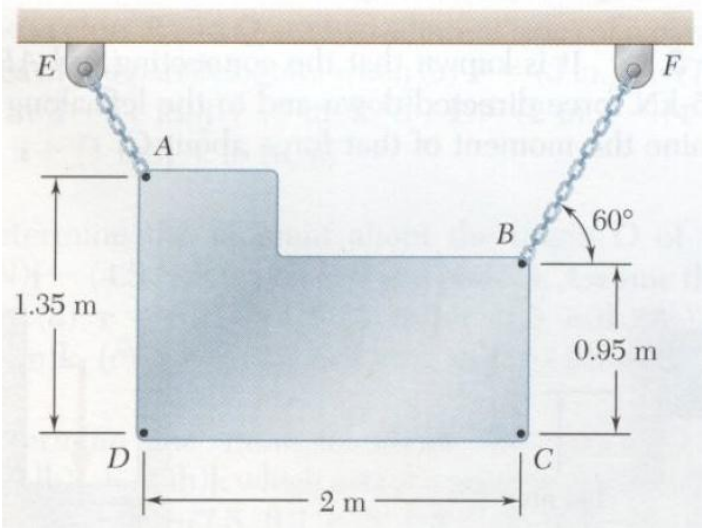

Figure Q4(a)

(i) the moment about *A* of the force exerted by the chain at *B*, and

(3 marks)

(ii) the smallest force applied at *C* which creates the same moment about *A*.

(6 marks)

(b) A floor truss is loaded as shown in Figure Q4(b). Determine the force in members *FI*, *HI*, and *HJ* using the method of section.

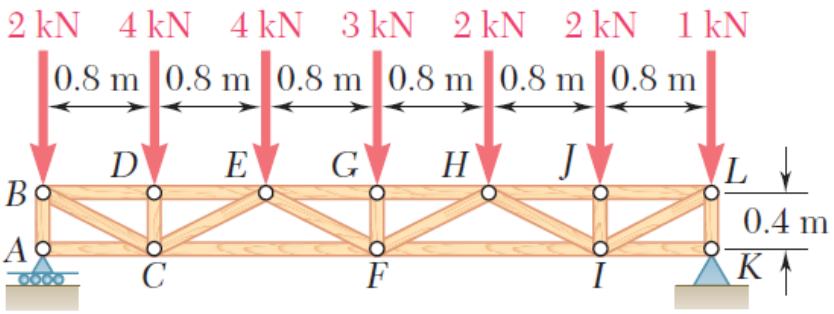

Figure Q4(b)

(10 marks)

(c) As a train accelerates uniformly it passes successive kilometer marks while traveling at velocities of 2 m/s and then 10 m/s. Determine.

(i) the train's velocity when it passes the next kilometer mark, and

(3 marks)

(ii) the time it takes to travel the 2-km distance.

(2 marks)

Question 5

(a) Neglecting the friction in Figure Q5(a), determine

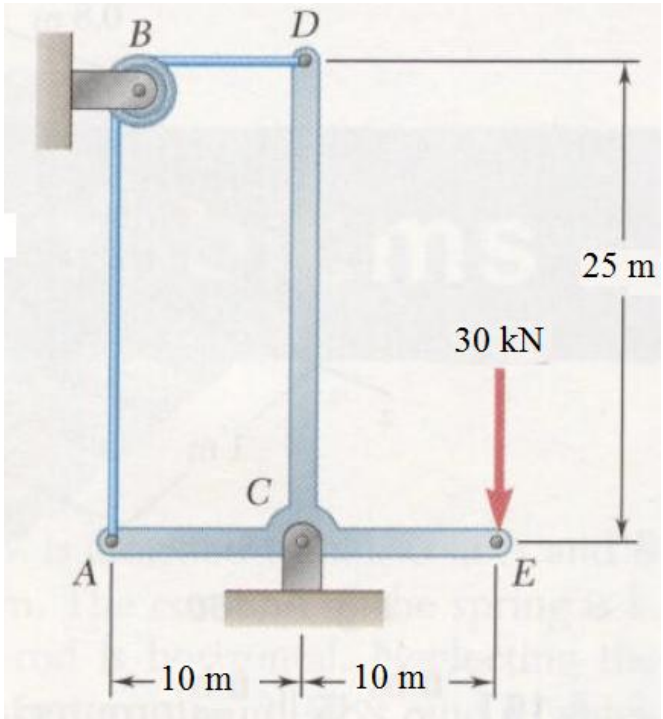

Figure Q5(a)

(i) the tension in cable *ABD*, and

(3 marks)

(ii) the reaction at support *C*.

(6 marks)

(b) The pitching machine is adjusted so that the baseball is launched with a speed of v_A = 30 m/s as shown in Figure Q5(b). If the ball strikes the ground at *B*, determine the two possible angles θ_A at which it was launched.

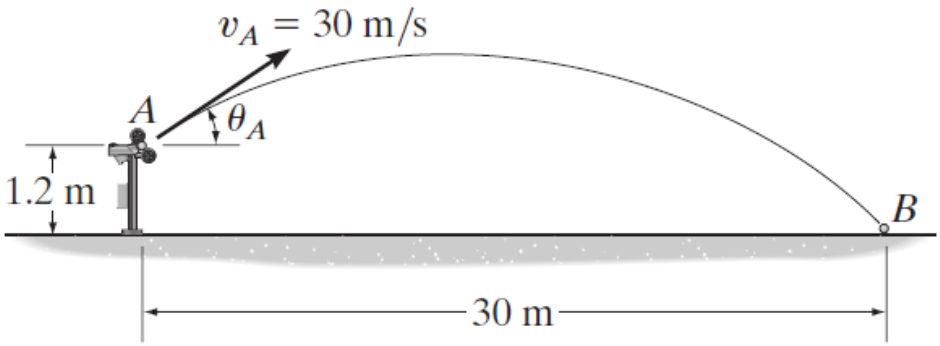

Figure Q5(b)

(8 marks)

(c) If the 5 kg block A shown in Figure Q5(c) slides down the place with a constant velocity when $\theta = 30°$, determine the acceleration of the block when $\theta = 45°$.

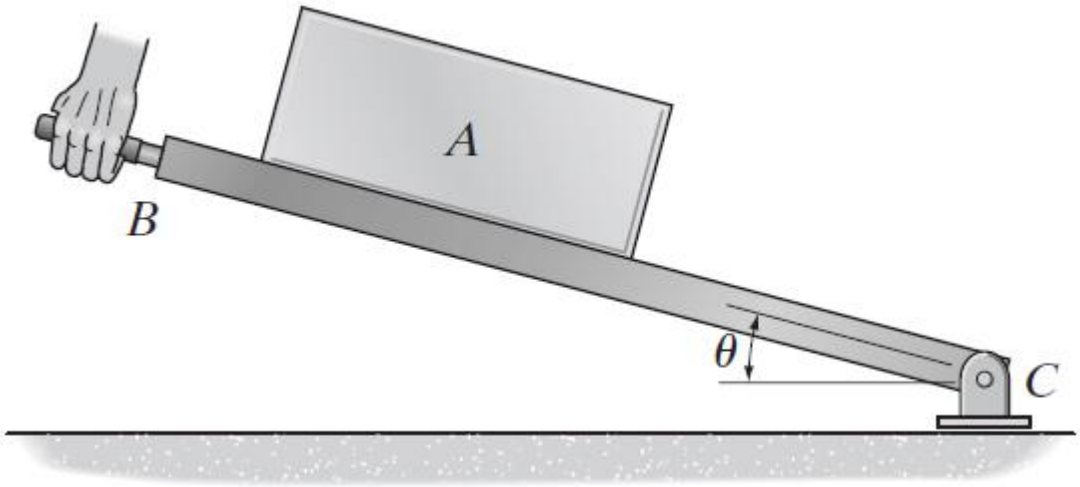

Figure Q5(c)

(8 marks)

--THE END—

(EGR1203(F)/May2014 /Tan Kwee Yong/25052014)