INTI INTERNATIONAL UNIVERSITY
FOUNDATION IN SCIENCE (CFSI)
EGR 1203: ENGINEERING MECHANICS
FINAL EXAMINATION: JUNE 2015 SESSION

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) The ring A is subjected to the three forces as shown in **Figure Q1(a)**. If F_1=500N and $\theta = 20^o$, determine

(i) The magnitude of the resultant of these three forces, and .

(3 marks)

(ii) Its direction measured counterclockwise from the position x-axis .

(3 marks)

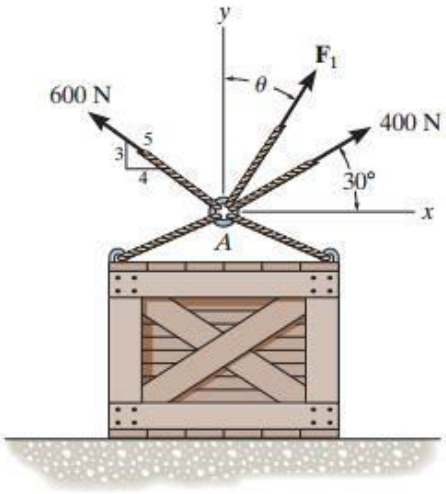

Figure Q1(a)

(b) The 8 kg lamp can be suspended in the position shown in **Figure Q1(b)**. The undeformed length of spring AB is $l'_{AB} = 0.4$ m, and the spring has a stiffness of $k_{AB} = 300N/m$.

(i) Draw the free body diagram of the system,

(4 marks)

(ii) Determine the required length of cord AC in **Figure Q1(b)**. (15 marks)

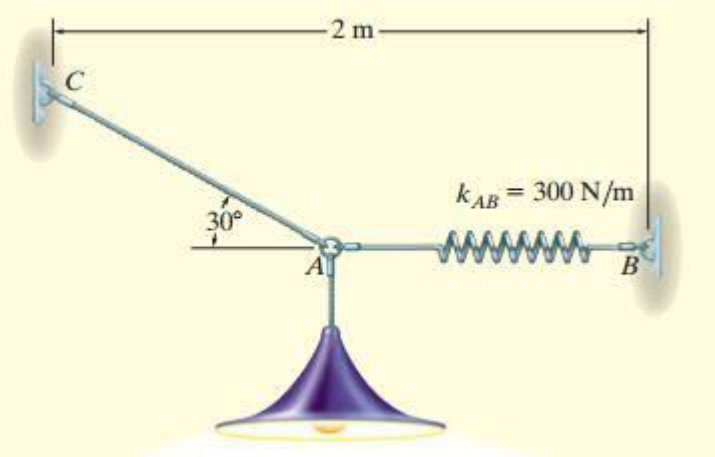

Figure Q1(b)

Question 2

Using the method of joints, determine all the force in each member of the truss shown in **Figure Q2** and state if the members are in tension or compression. Set $P = 4$ kN, sketch free-body-diagram at each joint.

(25 marks)

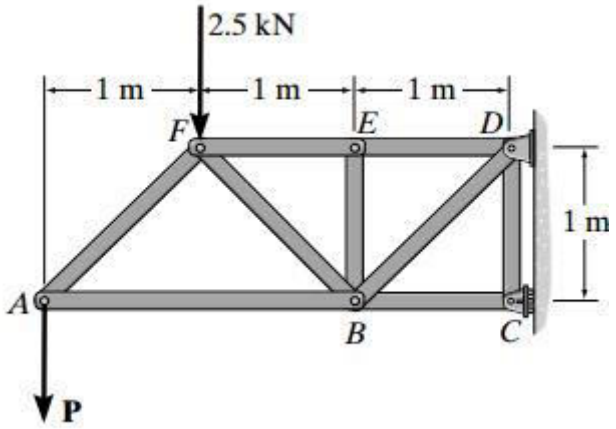

Figure Q2

Question 3

The beam AB subjected to distributed loading as shown in **Figure Q3**. Determine and draw free-body-diagram,

(i) The reactions on beam caused by the pin at A and the cable at point B and D.

(10 marks)

(ii) The internal normal force, shear force, and moment at points E and F in the beam.
(15 marks)

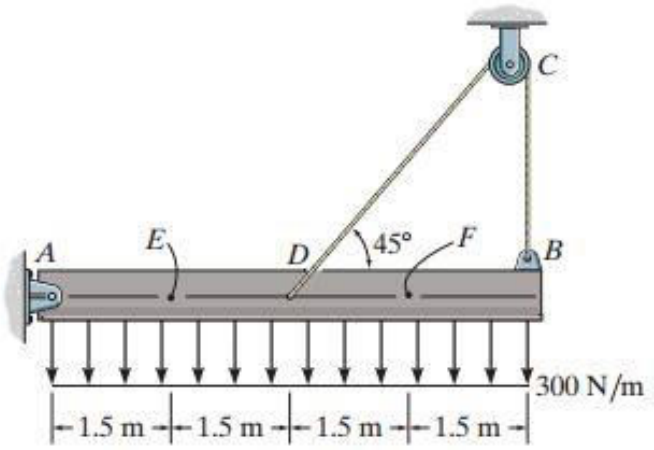

Figure Q3

Question 4

A 10-kg package drops from a chute into a 25-kg cart with a velocity of 3 m/s as shown in **Figure Q4**. Knowing that the cart is initially at rest and can roll freely, determine

(i) The final velocity of the cart (9 marks)
(ii) The impulse exerted by the cart on the package (9 marks)
(iii) The fraction of the initial energy lost in the impact. (7 marks)
(sketch free-body-diagram at each step).

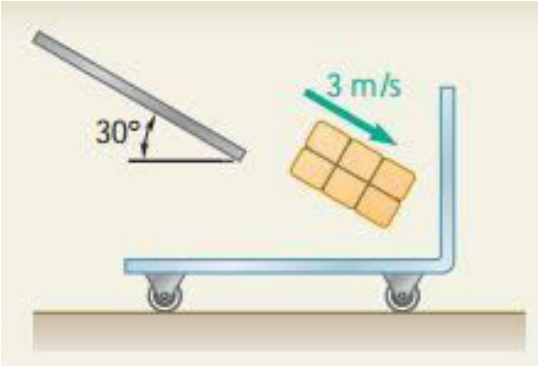

Figure Q4

Question 5

Collar A and block B are connected by a cable passing over three pulleys C, D, and E as shown in Figure Q5. Pulleys C and E are fixed while D is attached to a collar which is pulled downward with a constant velocity of 75mm/s. At t=0, collar A starts moving downward from position K with a constant acceleration and no initial velocity. Knowing that the velocity of collar A is 300 mm/s as it passes through point L,

(i) Draw the free-body –diagram and Compute the position in elevation D and B (17 marks)

(ii) Compute the velocity of block B when collar A passes through L. (4 marks)

(iii)Compute the acceleration of block B when collar A passes through L. (4 marks)

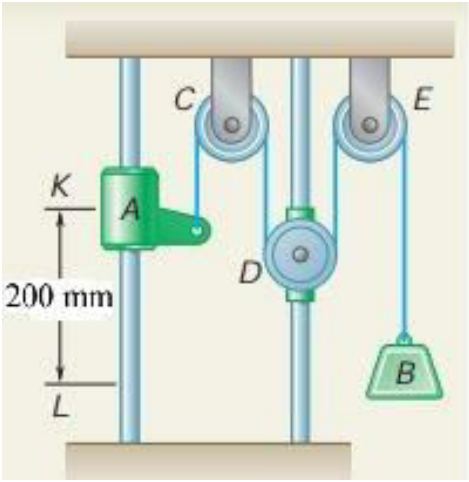

Figure Q5

THE END