UNIVERSITY OF BARISAL

Department of Computer Science and Engineering

1st Year 2nd Semester Final Examination, 2023

Session: 2022-2023

Course code: EEE-1207, Course name: Basic Mechanical Engineering

Time: 3 hrs. **Marks: 60**

1(a). Determine the tension in each cord used to support the 120-kg crate shown in Figure. **06**

1(b). Determine the stretch in each of the two springs required to hold the 25-kg crate in the equilibrium position shown. Each spring has an unstretched length of 2.1 m and a stiffness of k = 300 N/m. **06**

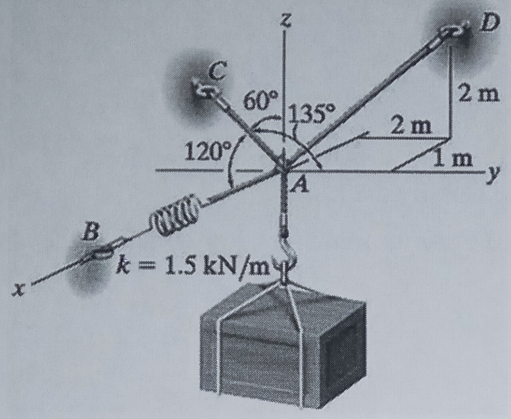

Figure for Q. No. 1(a).

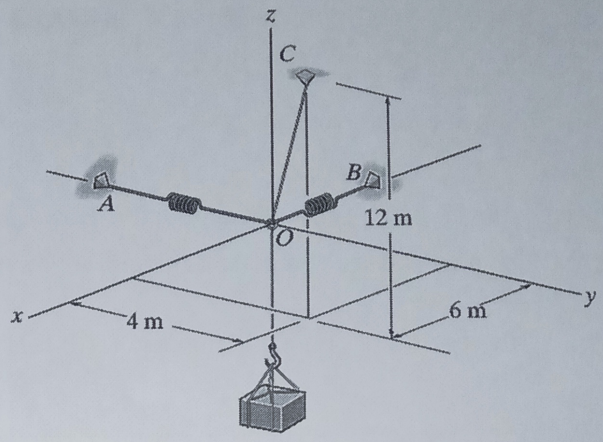

Figure for Q. No. 1(b).

2(a). Determine the components of the single couple equivalent to the two couples shown. **06**

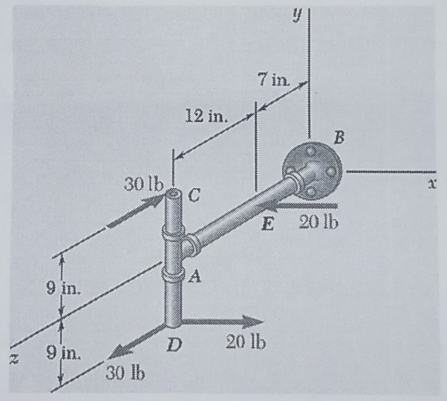

Figure for Q. No. 2(a)

2(b). Replace the force and couple moment system acting on the beam in figure by an equivalent resultant force, and find where its line of action intersects the beam, measured from point *O*. **06**

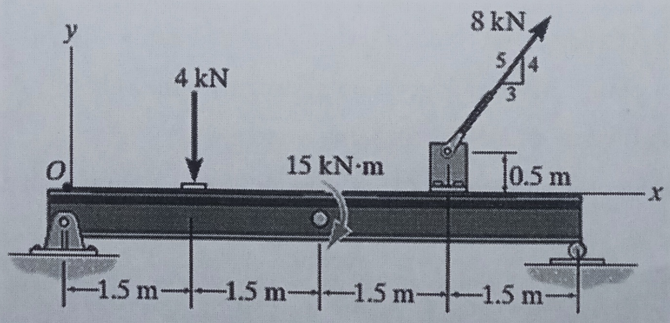

Figure for Q. No. 2(b)

3(a). Determine the components of the forces acting on each member of the frame shown. **06**

3(b). Determine the force in member GC of the truss and state if this member is in tension or compression. **06**

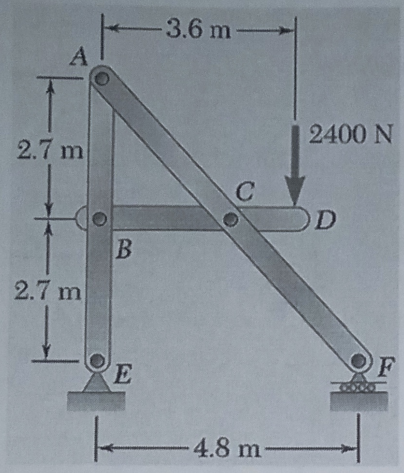

Figure for Q. No. 3(a).

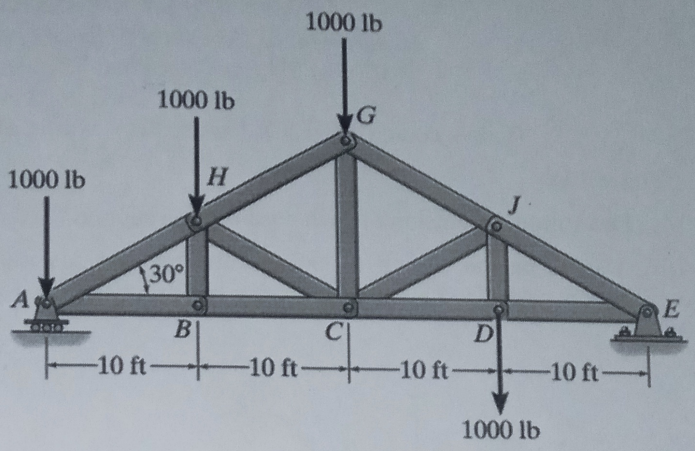

Figure for Q. No. 3(b).

4(a). Define "Robot". What can a robot do? How can you classify the Robot? **04**

4(b). What are the basic components of a Robotic system? State the main function of each of the components. **04**

4(c). Write shorts notes on: (i) Manipulator, (ii) End effector. **04**

5(a). What is sensor? Explain the mechanism of following sensors with their applications: **06**
(i) Ultrasonic distance sensor, (ii) Eddy current proximity sensor, and (iii) Piezoelectric sensor.

5(b). What is meant by Robot actuator? What are the different types of actuator used for Robot? **03**

5(c). Define and describe the forward kinematics and inverse kinematics. **03**

6(a). What are the differences between SI engine and CI engine? **02**

6(b). Write down functions of the following terms: **02**
a) Crankshaft, b) Piston, c) Flywheel, d) Connecting rod

6(c). Write down the operational sequence of four cycles of an IC Engine with appropriate sketch. **04**

6(d). Write shorts notes on the following terms: **04**
(i) Detonation, (ii) Swept volume, (iii) Compression ratio, and (iv) Scavenging.

7(a). What is meant by refrigeration? Explain the purpose and application of refrigeration. **03**

7(b). Explain the vapor compression refrigeration system with the help of P-h and T-s diagram. **03**

7(c). Describe the classification of air-conditioning system. **02**

7(d). Explain the working principle of a winter air-conditioning system with a suitable sketch. **04**

8(a). What is meant by energy? Distinguish between renewable energy and non-renewable energy. **04**

8(b). What are the properties of a good refrigerant? **03**

8(c). What is the function of a carburetor, a piston ring and a spark plug for a petrol engine? **03**

8(d). How can you classify refrigerants? What is the unit of refrigeration? **02**

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