University of Barishal

Department of Computer Science and Engineering

1st Year 2nd Semester Final Examination-2024

Admission Session: 2023-2024

Course Code: **EEE-1207**, Course Title: *Basic Mechanical Engineering*

Time: 3 Hours   **Marks: 60**

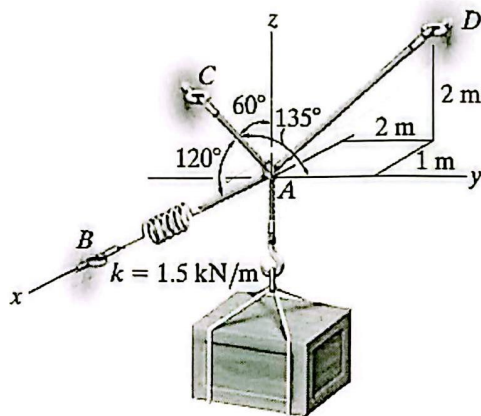1(a). Determine the tension in each cord used to support the 125-kg crate shown in Figure.   **06**

1(b). If cable AB is subjected to a tension of 780 N, determine the tension in cables AC and AD
and the magnitude of the vertical force **F**.   **06**

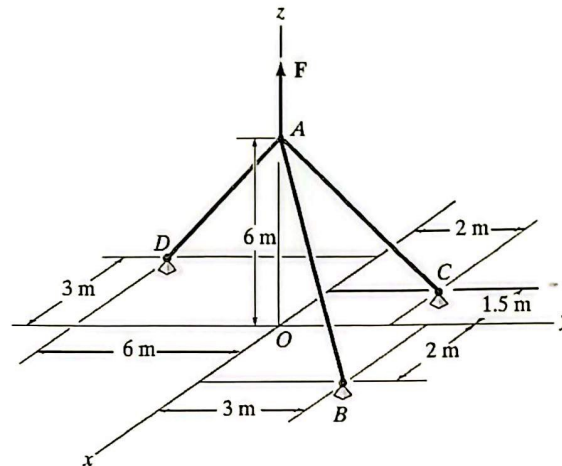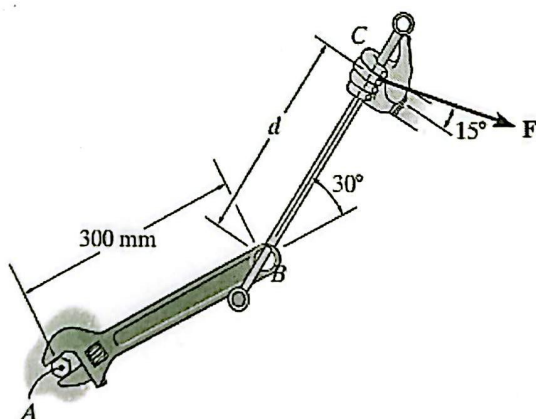Figure for Q. No. 1(a).   Figure for Q. No. 1(b).

2(a). The connected bar BC is used to increase the lever arm of the crescent wrench as shown. If
the applied force is $F = 250$ N and $d = 350$ mm, determine the moment produced by this force
about the bolt at A.   **06**

2(b). Replace the loading acting on the beam by a single resultant force. Specify where the force
acts, measured from end A and from B.   **06**

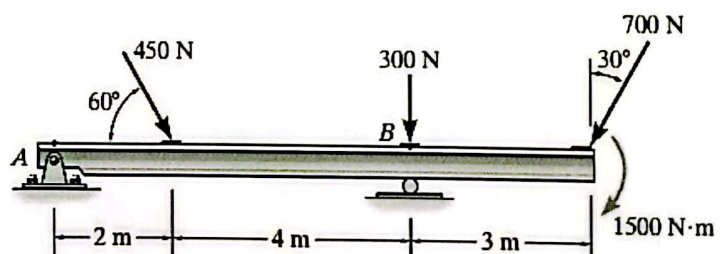Figure for Q. No. 2(a)   Figure for Q. No. 2(b)

3(a). Determine the force in member EB of the roof truss shown in figure. Indicate whether the
member is in tension or compression.   **06**

3(b). Determine the components of the forces acting on each member of the frame shown   **06**
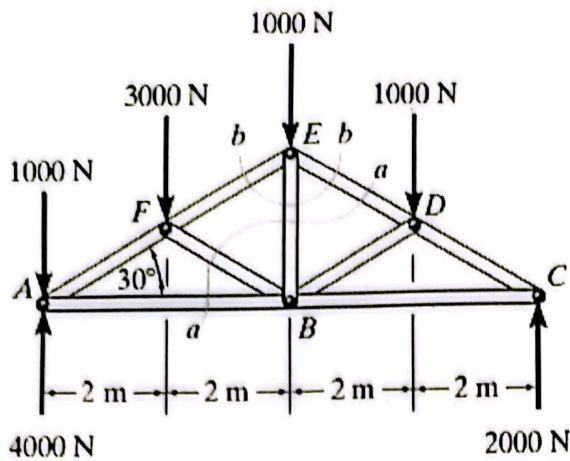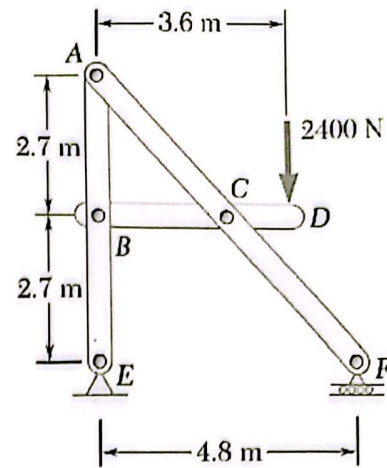
Figure for Q. No. 3(a).

Figure for Q. No. 3(b).

4(a). What is meant by Robot? Why are robots used in different sectors of industries and places? **04**

4(b). Write down the basic components of a Robotic system. Also, state the main function of each of the components. **04**

4(c). How can you classify the Robot manipulators? Describe them shortly. **04**

5(a). What is meant by Robot sensor? Explain the mechanism of following sensors with their applications: **04**

        i)   Potentiometer sensor, ii)   Optical encoder.

5(b). What is meant by Robot actuator? What are the different types of actuators used for Robot? **04**

5(c). What is forward kinematics and inverse kinematics? Describe them with example. **04**

6(a). What are the differences between Spark Ignition engine and Compression Ignition engine? **02**

6(b). Write down functions of the following terms: **02**

        i) Cylinder block, ii) Piston ring, iii) Flywheel, iv) Connecting rod

6(c). "Write the Diesel engine's four-stroke cycle with a sketch. **04**

6(d). Write shorts notes on the following terms: **04**

    (i) Knocking, (ii) Total and clearance volume, (iii) Compression ratio, and (iv) Scavenging.

7(a). What are the properties of a good refrigerant? Write the full name of two refrigerants. **04**

7(b). Explain the vapor compression refrigeration system with the help of a suitable diagram. **04**

7(c). Explain the working principle of a year-round air-conditioning system with a suitable sketch. **04**

8 (a). Define energy? Distinguish between conventional and non-conventional sources of energy. Also discuss the present electrical energy situation in Bangladesh. **05**

8 (b). Explain the term degrees of freedom with appropriate example. **03**

8 (c). Describe the working principle of a winter air conditioning system with appropriate sketches. **04**