UNIVERSITY OF BARISHAL

Department of Computer Science and Engineering

1st Year 2nd Semester Final Examination 2022

Course Code: EEE-1207

Course Title: *Basic Mechanical Engineering*

Time: 03 Hours **Marks:** 60

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

1(b). If cable *AB* is subjected to a tension of 750 N, determine the tension in cables *AC* and *AD* and the magnitude of the vertical force F. **06**

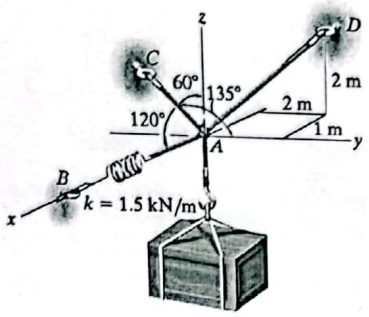

Figure for Q. No. 1(a).

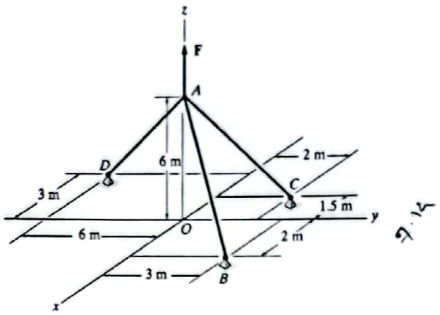

Figure for Q. No. 1(b).

2(a). The connected bar *BC* is used to increase the lever arm of the crescent wrench as shown. If a clockwise moment of M_A = 125 Nm is needed to tighten the bolt at *A* and the force F = 210 N, determine the required extension d in order to develop this moment. **06**

2(b). Replace the loading on the frame by a single resultant force. Specify where its line of action intersects member *AB*, measured from *A*. **06**

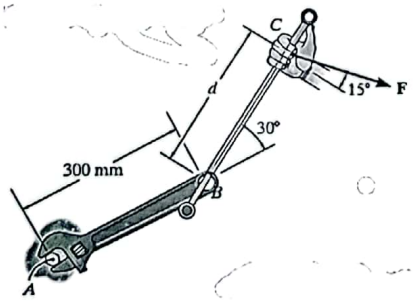

Figure for Q. No. 2(a)

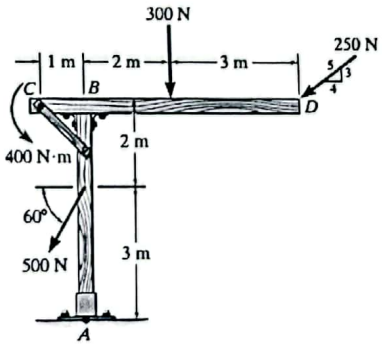

Figure for Q. No. 2(b)

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). A pulley and two loads are connected by inextensible cords as shown. Load *A* has a constant acceleration of 310mm/s^2 and an initial velocity of 250mm/s, both directed upward. Determine (*a*) the number of revolutions executed by the pulley in 3s, (*b*) the velocity and position of load *B* after 3s, (*c*) the acceleration of point *D* on the rim of the pulley at $t = 0$. **06**

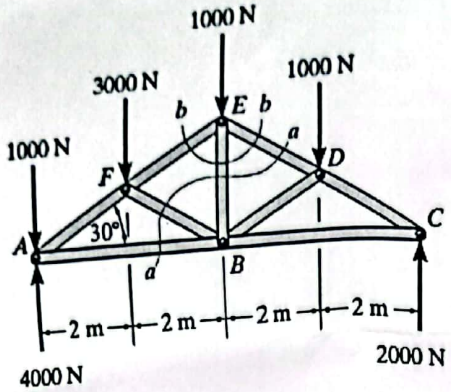

Figure for Q. No. 3(a).

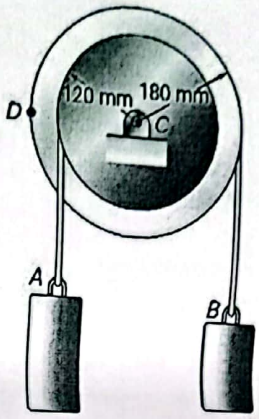

Figure for Q. No. 3(b).

4(a). What is meant by Robot? Why robots are used in different 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 sensor? Describe the mechanism of the following sensors with their applications: i) Ultrasonic distance sensor ii) Infrared distance sensor and iii) Laser range sensor. **06**

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

5(c). Write down the characteristics of Actuator systems. Also discuss about robot axis. **03**

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

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

i) Crankshaft, ii) Piston, iii) Flywheel, iv) 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 refrigeration? Explain the purpose and application of refrigeration. Also write down the properties of a good refrigerant? **03**

7(b). Define energy? Distinguish between conventional and non-conventional sources of energy. Also discuss the present electrical energy situation in Bangladesh **06**

7(c) Define: i) Brake power, ii) Specific fuel consumption. **03**

8(a). Define human comfort. What are the factors that affect comfort air conditioning? Also write down the classification of air-conditioning system. **04**

8(b). Describe the vapor absorption refrigeration system with neat sketches. **05**

8(c). Explain the terms i) COP, ii) Tonne of refrigeration and iii) Refrigeration cycle **03**

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