UNIVERSITY OF BARISAL
Department of Computer Science and Engineering
1st Year 2nd Semester Final Examination, 2020
Course code: EEE-1207
Course name: *Basic Mechanical Engineering*

Time: 3 hrs.   Marks: 60

1(a). For a new sailboat, a designer wants to determine the drag force that may be expected at a given speed. To do so, she places a model of the proposed hull in a test channel and uses three cables to keep its bow on the centerline of the channel. Dynamometer readings indicate that for a given speed, the tension is 40 lb in cable AB and 60 lb in cable AE. Determine the drag force exerted on the hull and the tension in cable AC.   06

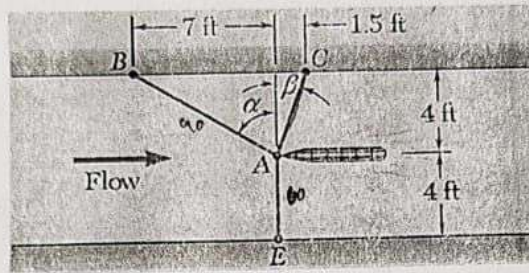Figure for Q. No. 1(a).

1(b). A tower guy wire is anchored by means of a bolt at A. The tension in the wire is 2500 N. Determine (a) the components F_x, F_y, and F_z of the force acting on the bolt and (b) the angles θ_x, θ_y, and θ_z defining the direction of the force.   06

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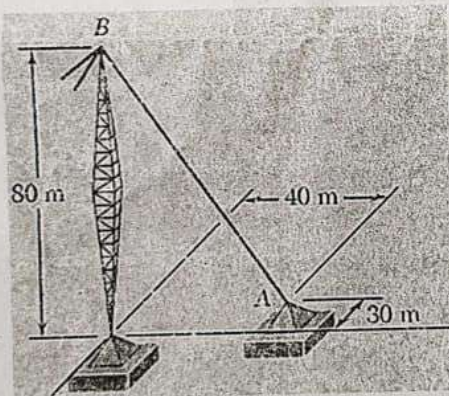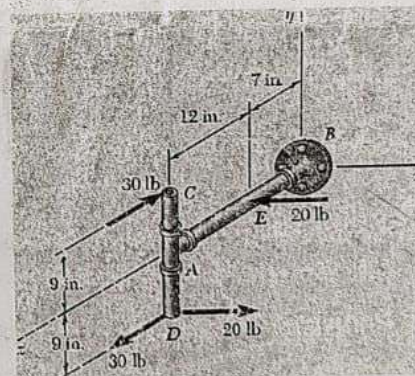

Figure for Q. No. 1(b).

Figure for Q. No. 2(a).

2(b). A 4.80m long beam is subjected to the forces shown. Reduce the given system of forces to (a) an equivalent force-couple system at A, (b) an equivalent force-couple system at B, (c) a single force or resultant.   06
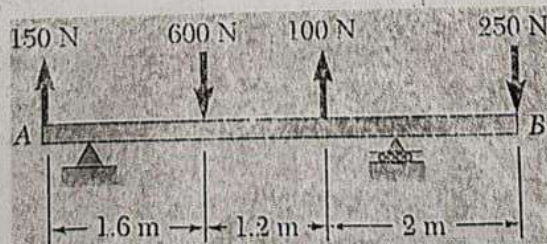

Figure for Q. No. 2(b).

3(a). Write down the differences between field robots and service robots. Also explain robot control methods.   04

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

3(c). Define the following terms: 04

(i) Manipulator, (ii) End effector.

4(a). Define sensor? Explain the mechanism of following sensors with their applications: 04

(i) Piezoelectric sensor, (ii) Eddy current proximity sensor. (iii) Ultrasonic Distance Sensor

4(b). Write down the different types of actuators used for Robot with their advantages and disadvantages? Also discuss about Robot Axis. 04

4(c). What is meant by forward kinematics and inverse kinematics? Explain. 04

5(a). What are the advantages and disadvantages of 2-stroke engine over 4-stroke engine? 02

5(b). Write shorts notes on the following terms: 05

(i). Crankshaft (ii). Piston ring (iii). Flywheel. (iv). Spark plug. (v). Swept volume of an internal combustion engine.

5(c). Write down the operational sequence of four cycles of an IC Engine with appropriate sketch. 03

5(d). What are the differences between SI engine and CI engine? 02

6(a). What is refrigeration? Explain the purpose and application of refrigeration. 03

6(b). Explain the vapor absorption refrigeration system with the help of a suitable sketch. 03

6(c). Explain the working principle of a Year-round air-conditioning system with a suitable sketch. 03

6(d) Define: i) Brake power, ii) Detonation, and iii) Specific fuel consumption. 03

7(a). Define energy? Distinguish between conventional and non-conventional sources of energy. Also discuss the present electrical energy situation in Bangladesh. 04

7(b). Describe briefly about the conversion of solar energy to electrical energy. 04

7(c). Write down the advantages of using renewable energy? Give some examples of renewable energy. 04

8(a). Describe the classification of IC Engine. 04

8(b). What are the factors that affect the human comfort? Explain all of them. 04

8(d). Define COP? What is meant by Tonne of refrigeration (TR)? 04

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