

Ahsanullah University of Science and Technology
Department of Computer Science and Engineering
1st Year 2nd Semester Final Examination (Spring 2017)

Course No: ME 1211
Time: 3 (three) hours

Course Title: Basic Mechanical Engineering
Full Marks: 70

There are SEVEN Questions. Answer any FIVE Questions.

The figures in the margin indicate full marks.

Assume reasonable values for missing data.

All symbols have their usual meaning.

- Q.1 (a)** What are the different processes involved in reversed carnot cycle? Draw the schematic diagram of the cycle and show the processes on T-S diagram. (4)
- (b)** A vapor compression refrigeration system has got condenser-side temperature of 33°C and the evaporator-side temperature of -20°C. What is its COP? Also find the power rating of its compressor if it has a cooling load of 20 ton. (4)
- (c)** What do you understand by ozone layer depletion? What are the effects of ozone layer depletion? (3)
- (d)** Draw the schematic diagram of three cycle cascade refrigeration system. (3)

- Q.2 (a)** Make comparison between split type, ducted split type and multi-split type air conditioning system with respective schematic diagram. (6)

- (b)** Briefly describe the evaporative cooling process with example. (2)

- (c)** In an air conditioning system return air at 25°C and 50% relative humidity at a rate of 3 kg/s is mixed with fresh air at 35°C and 70% relative humidity at a rate of 1 kg/s to form a mixture. By using the supplied psychrometric chart, determine the following of the mixture: (6)

- (i) The relative humidity
 (ii) The absolute humidity
 (iii) The specific enthalpy
 (iv) The dry bulb temperature
 (v) The wet bulb temperature
 (vi) The dew point temperature.

Attach the used psychrometric chart with your answer script.

- Q.3 (a)** Why the inlet valves are opened earlier with respect to TDC and sparks are given earlier with respect to TDC in a four stroke SI engine? (2)

- (b) What are the functions of coolant in internal combustion engine? Draw the flow diagram of cooling system in a car engine. (2)
- (c) Draw the actual indicator diagram of a four stroke petrol engine. (3)
- (d) The compression ratio in an air-standard Otto cycle is 10. At the beginning of the compression stroke the pressure is 0.1 MPa and the temperature is 30°C . The heat transfer to the air per cycle is 2000 KJ/Kg. Determine: (7)
- (i) the pressure and temperature at the end of each process of the cycle, and
- (ii) the thermal efficiency.

- Q.4 (a) Define payload, reach, precision and repeatability. (4)
- (b) Give the name of some common type actuators. (2)
- (c) Describe the coordinate systems that are used in robot. (4)
- (d) What is Degrees of freedom? How many degrees of freedom a typical human hand has and what are these degrees of freedom? (4)

- Q.5 (a) Three forces act on a bolt as shown. Determine the resultant of the forces on the bolt. (6)

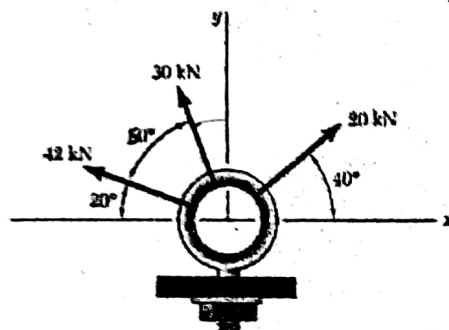


Figure for Q. 5(a)

- (b) Determine the reactions at A and C when $\alpha = 0^\circ$. (8)

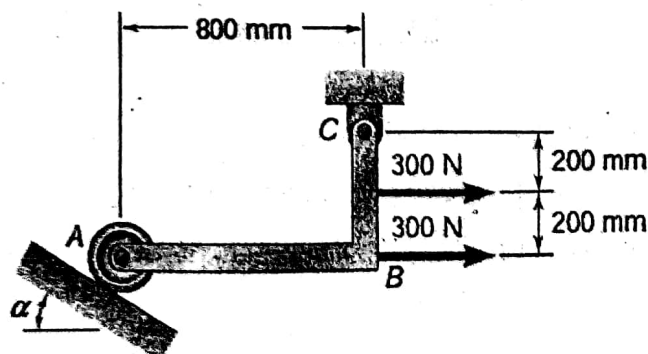


Figure for Q. 5(b)

Q.6

Using the method of joints, determine the force in each member of the truss shown. State whether the member is in tension or compression. (14)

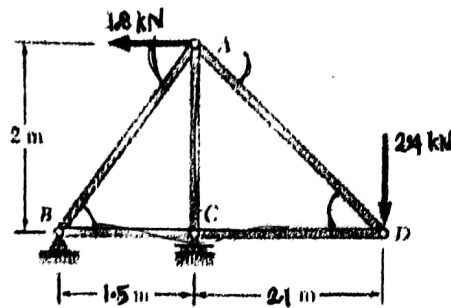


Figure for Q. 6

Q.7 (a) Slider block A moves to the left with a constant velocity of 6 m/s. Determine (7)

(i) the velocity of block B, (ii) the velocity of portion D of the cable, (iii) the relative velocity of portion C of the cable with respect to portion D. The horizontal plane and the block are frictionless.

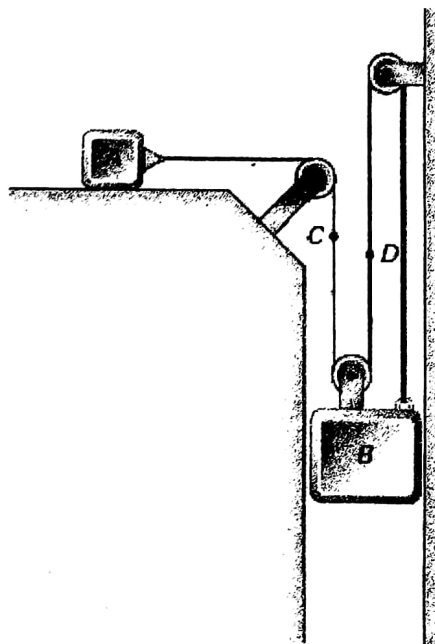


Figure for Q. 7(a)

(b) The two blocks as shown in the figure for Q. 7(b) are originally at rest. The incline plane and the pulley are frictionless, and the pulley is assumed to be of negligible mass. Determine the acceleration of each block and the tension in each cord. (7)

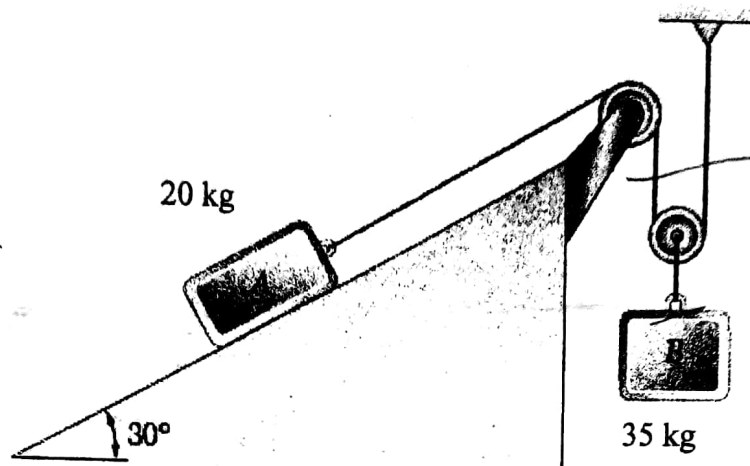


Figure for Q.7 (b)