

Roll No.

24088

**B. Tech 3rd Semester (AUE)
Examination – December, 2017**

ENGINEERING THERMODYNAMICS

Paper : AUE-205-F

Time : Three Hours] [Maximum Marks : 100

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt five questions in all, selecting one question from each Section. Question No. 1 is compulsory. All questions carry equal marks.

1. (a) What are adiabatic and diathermic walls ?
 $8 \times 2.5 = 20$
- (b) Show that energy is property of a system.
- (c) What is cyclic heat engine ?
- (d) What is a ton of refrigeration ?
- (e) Define Dew Point Temperature.
- (f) What is a Black Body ?
- (g) What is Heat Exchanger ?
- (h) State First Law of thermodynamics.

SECTION – A

2. A certain water heater operates under steady flow conditions receiving 4.2 kg/s of water at 75°C temperature enthalpy 313.93 kJ/kg. The water is heated by mixing with steam which is supplied to the heater at temperature 100.2°C and enthalpy 2675 kJ/kg. The mixture temperature leaves the heater as liquid water at temperature 100°C and enthalpy 419 kJ/kg. How much steam must be supplied to the heater per hour? 20
3. How are the maximum temperature and maximum pressure in Rankine cycle fixed? Draw the p-v, t-s, h-s diagrams of Rankine cycle. Derive the efficiency of Rankine cycle. 20

SECTION – B

4. For the same compression ratio and heat rejection which cycle is most efficient Otto Diesel or Dual? Explain with p-v and t-s diagrams. 20
5. Write short notes on : 10 + 10
- (a) Reciprocating air compressors.
- (b) Isentropic flow of ideal gases through nozzles.

SECTION – C

6. A vapour compression refrigeration system uses R-12 and operates between pressure limits of 0.745 and 0.15 MPa. The vapour entering the compressor has a temperature of 10°C and the liquid leaving the condenser is at 28°C. A refrigerating load of 2 KW is required. Determine the COP and the swept volume of compressor if it has a volumetric efficiency of 76% and runs at 600 rpm. 20

7. With the help of neat sketch explain the working of Vapour Absorption refrigeration cycle. Also draw the p-h plot. 20

SECTION – D

8. Show that, for estimating radial heat conduction through a cylindrical wall, the log mean area of the inner and outer surfaces has to be considered. What is Fourier's law of heat conduction? 20
9. An oil cooler for lubrication system has to cool 1000 kg/h of oil ($C_p = 2.09$ kJ/kg K) from 80°C to 40°C by using a cooling water flow of 1000 kg/h available at 30°C. Give your choice for parallel flow or counter flow heat exchanger, with reasons. Estimate the surface area of the heat exchanger, if overall heat transfer coefficient is 24 W/m² K (C_p of water = 4.18 kJ/kg K). 20

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