

GANPAT UNIVERSITY**B. Tech. Semester: IV (Mechatronics Engineering)****Regular (CBCS) Examination/ April - June 2015****Energy Conversion Systems (2MC406)**

Time: 3 Hours

Total Marks: 70

- Instruction:**
1. Attempt All The Questions.
 2. Use of Steam table and Psychrometric Chart is Allow.
 3. Use of Non-programmable scientific calculator is permitted.
 4. Don't write anything on question paper.

SECTION - I

- Que.- 1** (A) Explain the Vapour Compression Refrigeration system with schematic diagram. Draw the P-H and T-S diagram for the same. **6**
- (B) Explain Vapour Absorption Refrigeration System. Give its advantages over Vapour compression refrigeration system. **6**

OR

- Que.- 1** (A) Enlist Various Components of Vapour Compression Refrigeration system and explain refrigerator evaporators and its types. **6**
- (B) What are the desirable properties for a good refrigerant? **6**
- Que.- 2** (A) Explains the following terms **5**
- (i) Dry Air (ii) Absolute Humidity (iii) Relative Humidity
(iv) Degree of saturation (v) Wet Bulb Temperature
- (B) What is by-pass factor derive the expression for the same? **6**

OR

- Que.- 2** (A) Explain Nuclear Reactor with diagram. **5**
- (B) Explain Rankine Cycle with P-V chart and derive an expression for efficiency of Rankine Cycle. **6**
- Que.- 3** (A) Draw layout of modern thermal power plant and enlist its various circuits. **6**
- (B) What are the factors affecting site selections of thermal power plant? **6**

SECTION - II

- Que.- 4** (A) A R-12 Refrigeration Machine has saturated suction temperature of 5°C and saturated discharge temperature of 40°C . Determine C.O.P. of the system. **6**

Temp. ($^{\circ}\text{C}$)	Pressure (bar)	Volume Vapour (m^3/kg)	Enthalpy (kJ/kg)		Entropy(kJ/kg-K)		Specific heat (kJ/kg K)	
			Liquid	Vapour	Liquid	Vapour	Liquid	Vapour
5	3.6375	0.04799	204.68	354.885	1.01685	1.5568	0.938	0.646
40	9.5909	0.01837	239.03	368.81	1.1315	1.5459	1.030	0.762

- (B) What is Refrigeration? Explain and derive 1 Ton refrigeration. **6**

OR

- Que.- 4** (A) A R-12 Vapour compression Refrigeration System has a Condensing temperature of 50°C and Evaporating temperature of 0°C . The refrigeration Capacity is 7 tons. The liquid leaving the condenser is saturated liquid and compression is isentropic. Determine **6**
- (i) Refrigerant Flow rate (ii) Power required to run the Compressor
(iii) Heat rejected in the plant (iv) COP of the System.
- (B) Explain Electrolux refrigerator with neat sketch. **6**

- Que.- 5 (A) The barometer for atmospheric air reads 750 mm Hg. The dry bulb temperature is 33°C ; wet bulb temperature is 23°C . determine 5
- (i) Relative humidity
 - (ii) Humidity Ratio
 - (iii) Dew Point Temperature
 - (iv) Density of Air
- (B) A 4-S 4 Cylinder diesel engine running at 2000 rpm develops 60 W with break 6
thermal efficiency of 30% and CV of the fuel is 42 MJ/kg. Engine bore is 120 mm
and stroke is 100 mm if density of air is 1.15 kg/m^3 with air fuel ratio of 15:1 with
mechanical efficiency of 80%. Determine
- (i) Fuel Consumption (kg/s)
 - (ii) Air Consumption (m^3/s)
 - (iii) Indicating Thermal Efficiency
 - (iv) Volumetric Efficiency
 - (v) Break Mean Effective Pressure
 - (vi) Piston Speed

OR

- Que.- 5 (A) The humidity ratio of atmospheric air at 27.5°C is 0.016 kg/kg of air. Determine 5
- (i) partial pressure of vapour
 - (ii) relative humidity
 - (iii) dew point temperature
- Assume standard barometric pressure of 760 mm of Hg.
- (B) An Engine working on Otto Cycle has a Clearance of 1% of stroke volume and 6
Initial pressure of 0.95 bar and temperature 30°C . if the pressure at the end of
Constant volume heating is 28 bar. Find
- (i) An air standard Efficiency
 - (ii) The maximum temperature in the cycle
 - (iii) Ideal mean effective Pressure

- Que.- 6 (A) In a Rankine Cycle, the steam at inlet to turbine is saturated at a pressure of 30 bar 6
and exhaust pressure is 0.25 bar. Determine pump work, Turbine Power, Rankine
Efficiency, Condenser Heat Flow, dryness Fraction at the end of Expansion.
Assume Flow Rate of 10 kg/s.
- (B) A steam Power Plant operates at a boiler pressure of 50 kgf/cm^2 and condenser 6
pressure of 0.05 kgf/cm^2 , steam coming out of the boiler is dry and saturated.
Calculate the thermal efficiency if it operates on Rankine Cycle.

ALL THE BEST