

GANPAT UNIVERSITY
B.TECH SEM. IVTH MECHATRONICS ENGINEERING
CBCS REGULAR EXAMINATION MAY/JUNE - 2013
2MC406 ENERGY CONVERSION SYSTEMS

TIME: - 3 HOURS

TOTAL MARKS-70

- INSTRUCTIONS:** (1) All questions are compulsory.
 (2) Assume suitable data if necessary.
 (3) Figure to the right indicates full marks.
 (4) Steam table, Psychrometric chart and Mollier diagram is allowed.

SECTION - I

- Que.-1 a** A refrigeration machine using R-12 as refrigerant operates between the pressures limits of 2.5 bar and 9 bar. The compression is isentropic and there is no sub cooling in the condenser. The vapour is dry and saturated at the end of compression. Estimate the theoretical C.O.P. If the actual C.O.P is 0.65 of the theoretical value, calculate the net cooling produced per hour. The refrigerant flow is 5 kg/min. Properties of the refrigerant are: 06

Pressure (bar)	Saturation Temp. (°C)	Enthalpy (kJ/kg)		Entropy of dry and saturated vapour (kJ/kg)
		Liquid	Vapour	
9.0	36	70.55	201.8	0.6836
2.5	-7	29.62	184.5	0.7001

- b** Explain the p-h chart for refrigerant. Give the advantages of VARS. 06
- OR**
- Que.-1 a** Explain the simple VCR system with neat sketch. Also give advantages and disadvantages of VCR system. 06
- b** Explain the working of Domestic Electrolux refrigerator with neat sketch. 06
- Que.-2 a** Derive the equation, $\phi = \frac{\mu}{1 - (1-\mu)\frac{P_s}{P_b}}$ for air-vapour mixture. 05
- b** The humidity ratio (W) of atmospheric air at 28°C dry bulb temperature and 760 mm of Hg is 0.016 kg/kg of dry air. 06
 Determine:
 (i) Partial pressure of water vapour
 (ii) Relative humidity
 (iii) Dew point temp.
 (iv) Vapour density.

OR

- Que.-2 a** Give the name of the different Psychrometric processes. Explain humidification and dehumidification process with neat sketch. 06
- b** Define the following terms: 05
- | | | |
|------------------------|--------------------------|-------------------------|
| (i) DBT | (ii) Saturated air | (iii) Specific humidity |
| (iv) Relative humidity | (v) Degree of saturation | |

Que.-3

Attempt Any Three.

- a Explain any two components of nuclear Reactor with neat sketch.
- b Explain the factors considering during the site selection of Nuclear power plant.
- c Define the following terms:
 (i) Isotopes (ii) Binding energy (iii) Fission reaction
 (iv) Fusion reaction (v) Chain reaction (vi) Mass number.
- d Define the following terms:
 (i) Suction pressure (ii) Discharge pressure (iii) Compression ratio
 (iv) Suction volume (v) Swept volume (vi) Compressor capacity.

SECTION - II

Que.-4

- a Describe the Morse test. 06
- b Define the following terms: 06
 (i) Indicated power (ii) Brake power (iii) mean effective pressure
 (iv) Mechanical efficiency (v) SFC (vi) Fuel-Air ratio.

OR

Que.-4

- a Explain the Brayton cycle with P-V and T-S diagram. Also derive its equation for thermal efficiency. 06
- b In a laboratory experiment the following observations were noted during the test of a four stroke diesel engine: Area of indicator diagram = 420 mm², Length of indicator diagram = 6.2 cm, spring number = 1.1 bar/mm, Diameter of piston = 110 mm, Length of stroke = 150 mm, Engine speed = 450 r.p.m. 06
 Determine:
 (i) Indicated mean effective pressure
 (ii) Indicated power.

Que.-5

- a Enlist the different circuits of power plant. Explain any two circuits. 06
- b A steam power plant works on a simple Rankine cycle of boiler pressure 35 bar and condenser pressure of 0.1 bar. If the temperature of steam entering in a turbine is 350°C, then Determine: (i) Cycle efficiency (ii) Specific steam consumption. Neglect the pump work. 05

OR

Que.-5

- a Explain the Reheat Rankine cycle with P-V and T-S diagram. Also derive the equation of thermal efficiency for Reheat Rankine cycle. 05
- b A simple Rankine cycle works between the pressures 28 bar and 0.06 bar. The condition of steam is dry and saturated. Calculate the cycle efficiency and Specific steam consumption for (i) Neglecting the feed pump work and (ii) Considering the feed pump work. 06

Que.-6

Attempt Any Three.

- a List the components of automobile and explain any one in detail. 12
- b List the systems of the automobile and explain any two.
- c Give the classification of an automobile with example.
- d Describe the factor considering during the site selection of thermal power plant.

END OF PAPER