

GANPAT UNIVERSITY
B.TECH SEM. IVTH MECHATRONICS ENGINEERING
REGULAR EXAMINATION MAY/JUN. - 2012
2MC-406: 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) Scientific calculator, steam table and Psychrometric chart is allowed.

SECTION - I

- Que.-1 a** The sling psychrometer in a laboratory test recorded the following readings: 06
 Dry bulb temperature is 35°C and Wet bulb temperature is 25°C. Find out: (i) Specific humidity (ii) Relative humidity (iii) Vapour density in air (iv) Dew point temperature. Take atmospheric pressure 76 cm of Hg.
b Explain the mechanism of VCR system with diagram. Write merits and demerits of VCR system. 06

OR

- Que.-1 a** A vapour compression refrigerator used methyl chloride (R-40) and operates between temperature limits of -10°C and 45°C. At the entry of compressor the refrigerant is dry saturated and after compression it acquires a temperature of 60°C. Find out: (i) Refrigeration effect (ii) COP of cycle. 06

Saturation Temp. (°C)	Enthalpy (kJ/kg)		Entropy (kJ/kg)	
	Liquid	Vapour	Liquid	Vapour
-10	45.4	460.7	0.183	1.637
45	133	480.6	0.485	1.587

- b** Define the following terms and derive equation:
 (i) Specific humidity (ii) Relative humidity (iii) Degree of saturation. 06
- Que.-2 a** With the help of Psychrometric chart, Find out: (i) Humidity ratio (ii) Relative humidity (iii) Dew point temperature (iv) Vapour density (v) Enthalpy of mixture (vi) Vapour pressure (in bar) of air having a dry bulb temperature of 30°C and 50% relative humidity. 06
b Explain the working of Domestic Electrolux refrigerator. 05

OR

- Que.-2 a** Sketch and explain cascade refrigeration system. Draw Cascade refrigeration system on T-S and P-H diagram. 06
b Explain how the Psychrometric chart is prepared. 05

- Que.-3 Attempt Any Three.**
- Describe with a neat sketch pressurized water reactor. Write its merits.
 - Draw neat sketch of nuclear reactor. Explain Coolant with its properties.
 - Give the difference between fission and fusion process.
 - Write the advantages and disadvantages of VAR system over VCR system.

SECTION - II

- Que.-4**
- In a steam turbine steam at 20 bar, 370°C is expanded to 0.08 bar. It then enters a condenser, where it is condensed to saturated liquid water. The pump feeds back the water into the boiler. Assume ideal processes; find the net work and cycle efficiency. **07**
 - Explain with the help of neat diagram a Reheat cycle. Derive also an expression for its thermal efficiency. **05**

OR

- Que.-4**
- Explain the methods of increasing the thermal efficiency of Rankine cycle. **06**
 - Enlist all circuits of thermal power plant. Explain any three in details. **06**

- Que.-5**
- The following readings were taken during a experiment of heat balance sheet on a single cylinder four stroke cycle oil engine: cylinder bore 190 mm, stroke length 345 mm, indicated mean effective pressure 6.5 bar, engine speed 230 rpm, fuel oil used per hour 3.2 kg, calorific value of oil 46320 kJ/kg, brake torque 440 Nm, mass of jacket cooling water per minute 5.5 kg, rise in temperature of jacket cooling water 41°C, mass of air supplied per minute 1.35 kg, temperature of exhaust gases 335°C, room temperature 21°C, mean specific heat of dry exhaust gases 1.005 kJ/kg K, hydrogen in fuel 14 % on mass basis, specific heat of steam in exhaust gases 2.3 kJ/kg K, Assume pressure of steam in exhaust gases 1.01325 bar. Find out: (i) Mechanical and Indicated thermal efficiencies and (ii) Draw up a heat balance sheet in kJ/min. **11**

OR

- Que.-5**
- Derive the air standard efficiency equation of Brayton cycle with P-V and T-S diagram. Why Brayton cycle is preferred for gas power plant? **06**
 - Enlist the method of measurement of Brake Power and explain eddy current dynamometer and writes its merits. **05**

- Que.-6 Attempt Any Three.**
- Explain rear engine versus front engine arrangement. **12**
 - Describe an automobile transmission system.
 - Enlist main units of an automobile. Describe basic structure of an automobile.
 - Describe factor considered during site selection of thermal power plant.

END OF PAPER