Student Exam No._____

GANPAT UNIVERSITY

B. Tech. Semester: III (MARINE) Engineering

Regular Examination November / December - 2013

2MR304 : APPLIED THERMODYNAMICS-1

Time: 3 Hours **Total Marks: 70**

Instruction: (1) All questions are compulsory.
(2) Assume suitable data if necessary.
(3) Figure to the right indicates full marks.
(4) Steam table, Psychometric chart, Moillier diagram and Scientific calculator is allowed.

Section - I

Que. – 1 (A) Draw P-v and T-s Diagram of the Carnot cycle and Derive the equation for the thermal efficiency of a Carnot cycle. **06**

(B) Explain the entropy generation for open system. **06**

OR

Que. – 1 (A) Define the entropy. Prove that Entropy is a property of the system. Enlist any four characteristics of the entropy. **06**

(B) Explain the Clausius Inequality. **06**

Que. – 2 (A) Draw the schematic, T-s and h-s diagram of the Rankine cycle, Regenerative cycle and Reheat Cycle. **06**

(B) In a steam power cycle, the steam supply is at 15 bar and dry & saturated. The condenser pressure is 0.4 bar. Calculate the Carnot and Rankine efficiency of the cycle. Neglect pump work. **05**

OR

Que. – 2 (A) Derive the equation of thermal efficiency of the Rankine cycle. And compare it with the Carnot cycle. **06**

(B) Explain the Reheat Rankine cycle. **05**

Que. – 3 **Attempt any two.** **12**

(A) Explain two feed water heating Rankine cycle.

(B) Explain the modified Rankine cycle.

(C) A Simple Rankine cycle works between pressure 28 bar and 0.06 bar, the initial condition of steam being dry saturated. Calculate the cycle efficiency, work ratio, and specific steam consumption.

Section – II

Que. – 4 (A) Derive the equation of the work done for operating a single stage reciprocating air compressor with considering the clearance volume. **06**

(B) Explain any one positive displacement air compressor. **06**

OR

Que. – 4 (A) Explain the two stage reciprocating air compressor with intercooler. **06**

(B) A reciprocating air compressor delivers air at a constant pressure of 8 bar. The condition of air at inlet is 1 bar and 27°C. If the index of compression is 1.3. Calculate the work done and heat transferred during compression. Also find the work done during delivery. Assume mass flow rate as unity. **06**

Que. – 5 (A) Derive the following equation for two stage reciprocating air compressor. $P_2 = \sqrt{P_1 P_3}$ **05**

where, P_1 = Suction Pressure, P_2 = Intermediate Pressure,

P_3 = Delivery Pressure.

(B) Explain the factor effecting the volumetric efficiency of a reciprocating air compressor. **06**

OR

Que. – 5 (A) Explain the volumetric analysis of gas mixture. **06**

(B) A vessel contains 8 kg of oxygen, 6 kg of nitrogen and 22 kg of carbon dioxide at 45°C temperature and 250 kPa pressure. Determine the Capacity of the vessel, the partial pressure of each gas present in the vessel and the total pressure in the vessel when the temperature is raised to 90°C. **05**

Que. – 6 **Attempt any two.** **12**

(A) Explain the sensible heating and Sensible cooling process.

(B) Explain the by-pass factor of heating and cooling coil.

(C) The atmospheric air at 760 mm of Hg, dry bulb temperature 15°C and wet bulb temperature 11°C enters a heating coil whose temperature is 41°C. Assume by pass factor of heating coil as 0.5, Determine dry bulb temperature, wet bulb temperature and relative humidity of air leaving the coil. Also determine the sensible heat added to the air per kg of dry air.

END OF PAPER