INDIAN MARITIME UNIVERSITY

(A Central University Government of India)

END SEMESTER EXAMINATION DECEMBER 2017

Programme : B. Tech (Marine Engineering) **Semester** : II

Subject Name : Applied Thermodynamics-I **Subject Code** : UG11T2203/UG11T1203

Date : 27.12.2017 **Maximum Marks** : 100

Time : 3 Hrs. **Pass Marks** : 50

PART-A (10×3=30)

ANSWER THE COMPULSORY QUESTION

1.a)State Clausius statement of second law of thermodynamics.

b) Define entropy and change of entropy.

c) Mention the improvements made to increase the ideal efficiency of rankine cycle.

d) What are the effects of condenser pressure on the rankine cycle.

e) Define Specific steam consumption of an ideal rankine cycle.

f) What are the factors that affect the volumetric efficiency of a reciprocating compressor?

g) What is compression ratio.

h) What is meant by free air delivered.

i) What is the difference between air conditioning and refrigeration.

j) State Amagats law of partial volume.

PART-B (5×14=70)

ANSWER ANY FIVE OF THE FOLLOWING

2.a)Dry saturated steam at 100 bar expands isothermally and reversibly to a pressure of 10 bar.calculate the heat supplied and the work done per kilogram of steam during the process.

(8 marks)

b)steam at 100 bar,375°C expands isentropically in a cylinder behind a piston to a pressure of 10 bar.calculate the work done per kilogram of steam. (6 marks)

3. Explain with block diagram and T-S diagram,the process of regenerative rankine cycle and how the efficiency of the cycle could be improved. (14 marks)

4.a)Explain modified rankine cycle in steam engines. (7 marks)

b) Consider a steam power plant operating on an ideal reheat rankine cycle, the steam enters the H.P turbine at 30 bar and 350°C ,after expansion to 5 bar ,the steam is reheated to 350°C and then expanded the L.P turbine to the condenser pressure of 0.075 bar.determine the thermal efficiency of the cycle and the quality of the steam at the outlet of the L.P turbine. (7 marks)

5. A single cylinder single acting reciprocating compressor takes in 8 m^3 /min of air at 1 bar and 15^0c and compress into 7 bar. calculate the saving in the power required when the compression Process is changed from adiabatic compression to isothermal compression. (14 marks)

6.a)A single acting air compressor compresses air from 1 bar to 7 bar,the clearance volume is 2 litres,the compression and expansion follows the law $PV^{1.3} = C$.if the volumetric efficiency of a compressor is 85%.find the stroke volume of the cylinder.Assume diameter of the piston is equal to stroke. (8 marks)

b) Explain Multi stage reciprocating air compressor with intercooler. (6 marks)

7. Atmospheric air at 760 mm of Hg barometric pressure has 25°C dry bulb temperature and 15°C wet bulb temperature. with the help of psychometric chart,determine a)relative humidity b)humidity ratio c) dew point temperature d)enthalpy of air per kg of dry air e)partial pressure of vapour f)saturation pressure corresponding to dry bulb temperature of 25°C g)saturation pressure corresponding to wet bulb temperature of 15°C h)volume of air/kg of dry air. (14 marks)

8. An air conditioned room is to be maintained at 18°C ,percentage saturation 40%,the fabric heat gains are 3000 W and there are a maximum of 20 people in the room at any time.neglecting all other heat gains or losses,calculate the required volume flow rate of air to be supplied to the room and its percentage saturation when the air supply temperature is 10°C. (14 marks)

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