INDIAN MARITIME UNIVERSITY

(A CENTRAL UNIVERSITY, GOVT. OF INDIA)

End Semester Examination December 2018

B. Tech. (Marine Engineering)

Semester - III

Applied Thermodynamics-II (UG11T2303)

Date: 02/01/2019 Max Marks: 100

Time: 3 Hrs. Pass Marks: 50

PART – A

Marks: 10X3=30

(All questions are compulsory)

1. a) Define Calorific value of fuel.

   b) Define Nozzle efficiency as applied to steam nozzles.

   c) How pressure – velocity compounding is done?

   d) How does impulse turbine work?

   e) What are the advantages of air refrigeration system.

   f) Give the 4 important parameters that are to be measured and controlled of an air conditioning system.

   g) Name four important properties of a good refrigerant.

   h) Give the law of radiation as applied between two infinite plane surfaces.

   i.)Define emissive power.

   j) Heat transfer takes place according to the second law of thermodynamics (true/false).Justify your statement.

PART – B

(Answer any 5 of the following) Marks:5X14=70

2.a) Explain the analysis of flue gases by 'Orsat's Apparatus' with neat sketch. (10 marks)

b)Determine the minimum air required per kg of solid or liquid fuel to burnt. (4 marks)

3. Air at 8.6 bar and 190°C expands at the rate of 4.5 kg/s through a convergent divergent nozzle into space at 1.03 bar. Assuming that the inlet velocity is negligible. Calculate the throat and the exit cross sectional areas of the nozzle. (14 marks)

4. Derive the expression for force, work done, diagram efficiency, stage efficiency and axial thrust in case of steam turbine. (14 marks)

5. A refrigerating plant using ammonia as refrigerant works between -5^0C and 25^0C.the gas is dry at the end of compression and there is no under cooling of liquid. Calculate the coefficient of performance of the cycle. Use the following table for properties of ammonia. (14 marks)

Temperature in ◦C	Enthalpy of liquid H_f	Latent heat H_{fg} Kj/kg	Entropy of Liquid S_f Kj/kg K
-5◦ C	-29.3	1293.8	-0.113
25◦ C	125.6	1172.4	0.427

6. In a stage of an impulse turbine provided with single row wheel, the mean diameter of the blades is 1 m. It runs at 3000 r.p.m. The steam coming from the nozzle at a velocity of 350 m/sec and the nozzle angle is 20^0.The rotor blades are equiangular.The blade friction factor is 0.86,determine the power developed if the axial thrust on the end bearing of a rotor is 120 N.

(14 marks)

7. a)State fourier law of heat conduction. (4 marks)

b) A wall of 0.6 m thickness having thermal conductivity of 1.2 W/mK. The wall is to be insulated with a material having an average thermal conductivity of 0.3 W/mK. inner and outer surface temperatures are 1000^0C and 10^0C.Heat transfer rate is 1400 W/m^2.calculate the thickness of insulation. (10 marks)

8.a) A refrigeration system works on reversed carnot cycle between the temperature limits of 40^0C and -10^0C.The capacity of the unit is 10 ton.determine a)COP b)work input in to the system c)amount of heat transferred from the system. (8 marks)

b) Draw and explain the reversed carnot cycle with p-v and T-s diagrams. (6 marks)

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