INDIAN MARITIME UNIVERSITY

(A central University, Government of India)

May/June 2018-END SEMESTER EXAMINATION

B. Tech (Marine Engineering)

Semester: I

Applied Thermodynamics II (UG11T2303/1303)

Date: 06-07-2018 **Maximum Marks: 100**

Time: 3 hrs **Pass Marks : 50**

PART-A

(All questions are compulsory)

(10 × 3=30)

1. a) Define stoichiometric air fuel ratio and actual air fuel ratio.

   b) Define excess air.

   c) What is the function of diffuser system?

   d) Define the term nozzle efficiency.

   e) What is "carry over loss" in an impulse turbine.

   f) What do you mean by the term "compounding" in steam turbines.

   g) What is the effect of sub cooling of liquid of a vapour compression system.

   h) Define the following terms: 1.Forced convection 2.Free convection.

   i) Explain with the help of an example the process of heat transmission by conduction.

   j) What is the difference between nozzle and diffuser?

PART-B

ANSWER ANY 5 FROM THE FOLLOWING 7 QUESTIONS

(5×14=70)

2. A sample of dry anthracite has the following composition by mass.

C – 90% , H -3% ,O -2.5% ,N-1% ; S – 0.5% ,ash – 3%

Calculate a) the stoichiometric A/F ratio. b) the A/F ratio and the dry and wet analysis of the products of combustion by mass and by volume, when 20% excess air is supplied.

(14)

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)

4. 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°.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)

5. A furnace wall is made up of 3 layers, inside surface with thermal conductivity 8.5 W/mK, the middle layer with conductivity 0.25 W/mK , the outer layer with conductivity 0.08 W/mK, the respective thickness of the inner ,middle and outer layers are 25 cm,5 cm and 3 cm respectively, the inside and outside wall temperatures are 600°C and 50°C respectively. find the thermal resistance, heat flow /m^2 and interface temperatures. (14)

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

   b)A refrigeration system works on reversed carnot cycle between the temperature limits of 40^{0}C and -10^{0}C.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)

7.A mild steel tank of wall thickness 10 mm contains water at 90°C. Calculate the rate of heat loss per m^2 of tank surface area when the atmospheric temperature is 15°C.the thermal conductivity of mild steel is 50 W/mK and the heat transfer coefficient for inside and outside the tank are 2800 W/m^2 K and 11 W/m^2 K respectively. Calculate also the temperature of the outside surface of the tank. (14)

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