Date:4/05/2010

Duration: 2 hour   Total marks: 45

Attempt all questions.

1. (a) How does a diesel engine differ from petrol engine?   (2 Marks)
   (b) An engine operating on an air-standard Diesel cycle sucks in air at 1 bar and 300K and compresses it to 40 bar before fuel injection. If the energy added (per cycle) as heat is 600 kJ/kg air, calculate the compression ratio, the cut off ratio, the thermal efficiency and the work done per kg air. Take C_p of air as 1.0045 kJ/kg.   (8 Marks)

2. (a) What is the principle on which the desert coolers or evaporative coolers function? Will it work in humid climate? Sketch the evaporative cooling process in a psychrometric chart.   (6 Marks)
   (b) Air enters an evaporative (or desert) cooler at 1 atm, 35°C and 20% relative humidity and it exits at 80% relative humidity. Determine (i) the exit temperature of the air and (ii) the lowest temperature to which the air can be cooled by this evaporative cooler.   (4 Marks)

3. (a) What is absorption refrigeration? Explain Ammonia-Water absorption refrigeration system in detail. How does an absorption refrigeration system differ from a vapor compression refrigeration system? What are the advantages and disadvantages of absorption refrigeration system?   (7 Marks)
   (b) An absorption system receives heat from a source at 110°C and maintains the refrigerated space at -25°C. If the temperature of the environment is 25°C, what is the maximum COP this absorption refrigeration system can have?   (3 Marks)

4. In a thermal power plant operating on a reheat cycle, steam at 50 bar and 500°C enters a high pressure turbine and leaves at 10 bar. Then this steam is reheated to 500°C before it is fed to a low pressure turbine. The condenser is maintained at 0.05 bar. Calculate the thermal efficiency of the power plant, the mass flow rate of steam for a net power output of 20MW and the quality of steam at the exit of the low pressure turbine.   (10 Marks)

5. What is the change ~~of change~~ of entropy in the gas, surroundings and Universe during a joule expansion? What is the change in internal energy of the gas? (All outside surfaces are adiabatic)
                                                                             (5Marks)

Ideal gas, p_i, V_i, T_i

Volume of A = Volume of B