MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : PC-ME401 Applied Thermodynamics

UPID : 004476

Time Allotted : 3 Hours *Full Marks :70*

The Figures in the margin indicate full marks.
Candidate are required to give their answers in their own words as far as practicable

Group-A (Very Short Answer Type Question)

1. Answer any ten of the following : [1 x 10 = 10]

(I) What is degree of reaction ?

(II) Give one example of liquid fuel.

(III) Name one cycle where phase change of working fluid is taking place.

(IV) What is apparatus dew point ?

(V) Which pressure is greater, static or stagnation ?

(VI) Write down the expression for isentropic efficiency explaining all the terms.

(VII) What is nozzle efficiency ?

(VIII) What is isothermal process ?

(IX) Name the type of seal used in steam turbine to prevent leakage.

(X) What is adiabatic flame temperature ?

(XI) Reheat pressure is generally how much percentage of boiler pressure ?

(XII) What is bulb depression ?

Group-B (Short Answer Type Question)

Answer any three of the following : [5 x 3 = 15]

2. Derive Diesel cycle efficiency with appropriate p-v diagram. [5]
3. Describe with neat sketch adiabatic saturation process. [5]
4. Write a short note on complete combustion with example. [5]
5. A diesel engine has a compression ratio of 14 and cut off takes place at 6% of stroke. Find the air standard efficiency. [5]
6. Compare Rankine cycle with Carnot cycle. [5]

Group-C (Long Answer Type Question)

Answer any three of the following : [15 x 3 = 45]

7. An ideal diesel engine operates within the temperature limits of 1700 K and 300 K and with a compression ratio of 16. Determine a) pressure and temperature at each cardinal point of the cycle, b) thermal efficiency of the engine,
c) work ratio and d) MEP [15]
8. (a) Show that enthalpy of a moist air stream remains constant during an adiabatic saturation process. [5]
   (b) Describe adiabatic mixing process. Also, show the process on psychrometric chart. [5]
   (c) Write short note on by pass factor of a heating and cooling coil. [5]
9. (a) Distinguish between ultimate and proximate analysis. [5]
   (b) Write a short note on dew point temperature of combustion products. [5]
   (c) Write a short note on types of fuel with examples. [5]
10. A steam power plant operates in a Rankine cycle with superheated steam. The inlet steam conditions are 20 bar, 360 ^{o}C. The steam undergoes isentropic expansion in the turbine and exhausted to a condenser operating at 0.08 bar. Determine the efficiency of the cycle for 1 kg/s mass flow rate of steam. Use of steam table is allowed. [15]
11. A reaction vessel contains a mixture of 1 mol H_2, 1 mol CO_2 and 1/2 mol O_2. The mixture is heated isobarically at 1 atm to 2500 K. Determine the equilibrium composition. [15]

*** END OF PAPER ***