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   [5]
    efficiency.
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   [15]
    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

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. https://www.makaut.com   [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   [15]
    20 bar, 360 $^{\circ}$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.

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   [15]
    isobarically at 1 atm to 2500 K. Determine the equilibrium composition.

*** END OF PAPER ***