(Pages : 3) **B – 6072**

Reg. No. : .....

Name : .....

Fourth Semester B.Tech. Degree Examination, June 2017

(2008 Scheme)

Branch : Mechanical Engineering

08.405 : THERMAL ENGINEERING (MU)

Time : 3 Hours Max. Marks : 100

Instruction : *Use of steam tables and mollier chart are* ***permitted****.*

PART – A

Answer **all** questions :

1. Why the Carnot cycle cannot be used for steam power plants ? What modifications have been made in the Carnot vapor power cycle while developing the rankine cycle ?
2. What do you mean by supersaturated flow in nozzles ?
3. Explain reheat factor. Why is its magnitude always greater than unity ?
4. A good fuel for a compression ignition engine will be a bad fuel for a spark ignition engine. Comment.
5. Write a short note about IICCI combustion.
6. Draw the schematic diagram of a simple gas turbine cycle with intercooled and reheat and briefly explain the working principle.
7. Define volumetric efficiency of an air compressor. State the effects of clearance volume and its advantages.
8. What is a rotary compressor ? How are rotary compressors classified ?
9. Write short notes about octane number and Cetane number of fuels. What is the value of octane number and Cetane number of ordinary petrol and diesal used in our country ?
10. Explain adiabatic flame temperature. **(10×4=40 Marks)**

P.T.O.

PART – B

Answer **any one full** question for **each** Module.

Module – I

11. a) Explain the working of a binary vapor cycle.

b) Steam approaches a nozzle with velocity of 250 m/s, pressure of 3.5 bar and dryness fraction 0.95. If the isentropic expansion in the nozzle proceeds till the pressure at the exit is 2 bar, determine the change in enthalpy and the dryness fraction of steam using the Mollier diagram. Calculate also the exit velocity from the nozzle and the area of the exit of the nozzle for flow of 0.75 kg/sec.

OR

12. a) Explain the working of LaMont boiler with a neat diagram.

b) A three stage steam turbine is fed at 26 bar and 370° C. The exhaust takes place at 0.05 bar. Interstage pressures are : 5 bar, 1 bar. The stage efficiency for all the stages is 80%. Determine

a) the rankine efficiency
b) the quality of steam at each stage
c) work done in kJ/kg at each stage
d) efficiency ratio
e) reheat factor.

Module – II

13. a) Write short notes about

a) Equivalence ratio
b) Gravimetric and volumetric analysis.

b) Determine the gravimetric analysis of the products of complete combustion of acetylene with 200 percent stoichiometric air.

OR

14. a) Briefly explain the stages of combustion in SI engines elaborating the flame front propagation.

b) The ratio of net work to turbine work of an ideal gas turbine plant is 0.563. Take the inlet temperature to the compressor as 300 K. Calculate the temperature drop across the turbine if the thermal efficiency of the unit is 35%. Assume a mass flow rate of 10 kg/s, Cp = 1 kj/kg K and $\gamma = 1.4$.

Module – III

15. a) How the volumetric efficiency of a reciprocating compressor is affected by
    i) speed of the compressor
    ii) delivery pressure.

    b) A single stage, double acting compressor has a free air delivery of 14 m^3/min. measured at 1.013 bar and 15°C. The pressure and temperature in the cylinder during induction are 0.95 bar and 32°C. The delivery pressure is 7 bar and index of compression and expansion, n = 1.3. The clearance volume is 5% of the swept volume. Calculate :
    i) Indicated power required
    ii) Volumetric efficiency.

OR

16. a) Explain the working of an axial flow air compressor.

    b) Write short note about the following :
    i) Roots blower
    ii) Vane compressor
    iii) Screw compressor
    iv) Centrifugal compressor.

(20×3=60 Marks)