ANNA UNIVERSITY COIMBATORE

B.E. / B.TECH. DEGREE EXAMINATIONS : DECEMBER 2009

REGULATIONS : 2007

THIRD SEMESTER : ELECTRICAL & ELECTRONICS ENGINEERING

070120032 – APPLIED THERMODYNAMICS

TIME : 3 Hours **Max.Marks : 100**

PART – A

(20 x 2 = 40 MARKS)

ANSWER ALL QUESTIONS

1. Define "Thermodynamic system". Name various types of system?
2. Define the following:
   a) Pure substance with examples b) Homogenous system
3. Define first law of Thermodynamics?
4. Prove that Cp-Cv=R
5. State the meaning of S.I and C.I engines. Why they ere called so?
6. Explain in detail with simple illustrations the working principle of a 4-stroke SI engine?
7. What does the terms S.I engine and C.I engine stand for? Bring out at least give important differences between them?
8. What is effect of cut-off ratio on the efficiency of diesel cycle when the compression ratio is kept constant?
9. Name any two important boiler accessories and state their function?
10. Name any four boiler accessories?
11. Describe a steam boiler for power production purposes with its accessories in detail.
12. Explain with simple illustration the working of any modern high pressure boiler.
13. Name any two types of air compressors.
14. Classify compressors according to working principle and stage.

15. State the advantages of after coolers.
16. What assumptions are made in theory of compressors?
17. Sketch a simple layout of compressor refrigeration system and explain the working principle.
18. Represent the theoretical vapour compression cycle on T-S and P-H diagrams
19. What is sub cooling? What is it effect on COP of vapour compression cycle?
20. State the condition of refrigerant as it enters the evaporator and condenser in a vapour compression refrigeration system?

PART – B

(5 x 12 = 60 MARKS)

ANSWER ANY FIVE QUESTIONS

21. One kg/s of fuel air mixture enters in a steady flow gas turbine at 40 bar and 1047° C with a velocity of 200 m/s. the mixture leaves the turbine at 1 bar with a velocity of 100 m/s. the turbine is well insulated so that the process may be assumed adiabatic. Calculate the output of the turbine. Assume Cp =1.05 kJ/kg K ,γ=1.4 and R=300 Nm/kg K

22. A heat pump working on the Carnot cycle takes in heat from a reservoir at 5°C and delivers heat to a reservoir at 60°C. The heat pump is driven by a reversible heat engine which takes in heat from a reservoir at 840°C and rejects heat at 60°C.The reversible heat engine also drives a machine that absorbs 30 Kw. If the heat pump extracts 17Kj/s from 50°C reservoir. Determine (i) The rate of heat supply from 840°C source. (ii) Rate of heat rejection to 60°C sink.

23. a Explain neat sketch and working principle of 4 stroke diesel engine 8

b Comparison between 2 stroke and 4 stroke engine 4

24. A gas turbine working on theoretical air cycle draws air initially at 25°C and 1 bar. The maximum pressure and temperature are 3 bar and 650°C.calculate air standard efficiency, heat supplied, heat rejected, work output per kg of air and exhaust temperature.

25. a Estimate the quantity of heat required to produce 5kg of steam at 6 bar from water at 0°C,when the steam is 80% dry and when it is at 300°C.Take Cp of superheat red as 2.3 kJ/kg K. 4

b Determine the quantity of heat required to produce 1kg of steam at a pressure of 6 bar from water, at a temperature of 25 °C, under the following conditions.(1)When the steam is 90% dry.(2)when it is heated to a temperature of 250 °C. Assume Cp for super heated steam as 2.3 kJ/kg K. 8

26. A single acting stage reciprocating compressor takes one m^3 of air per minute at 1.013 bar and 17° C and delivers it at 7 bar. The law of compression is $pV^{1.35}$ =constant. Clearance is neglected. Compressor runs at 300 rpm. Stroke to bore ratio is 1.5. Mechanical efficiency of compressor is 85% and motor transmission efficiency is 90%. Calculate mass of air delivered per minute, indicated power, bore and stroke, and the motor power.

27. Explain neat sketch and working principal of vapour compression refrigeration system

28. A simple of moist air has a DBT of 24°C and of 15°C under a total pressure of 740 mm of Hg. Find :

i) partial pressure of water vapour and dry air

ii) Relative humidity

iii) Absolute humidity

iv) Specific humidity

v) Specific enthalpy

vi) Specific volume

*******THE END*******