KUMARAGURU
college of technology
character is life

Register Number: ……

B.E DEGREE EXAMINATIONS: MAY 2015

(Regulation 2013)

Third Semester

AERONAUTICAL ENGINEERING

U13AET303: Aero Engineering Thermodynamics

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Control volume refers to a
   a) Specified mass b) fixed region in the space
   c) closed system d) Variable surface
2. A mixture of gas expands from 0.03m^3 to 0.06m^3 at a constant pressure of 10bar and absorbs 84 kJ of heat during the process. The change in internal energy of the mixture is _____
3. Heat and work are
   a) Intensive property b) Extensive property
   c) Path function d) Point functions
4. Heat transferred in a Adiabatic process is equal to_____
5. Reheating in a gas turbine
   a) increases the thermal efficiency b) increases the compressor work
   c) increases the turbine work d) decreases the thermal efficiency
6. In Carnot cycle, heat is rejected at_____ process
7. Intercooling in multi-stage compressors is done
   a) to cool the air during compression b) to cool the air at delivery
   c) to enable compression in two stages d) to minimize the work of compression
8. According to Stefan's law, the total radiation from a black body per second per unit area is directly proportional to the fourth power of the _____
9. Sub – cooling is a process of cooling the refrigerant in vapour compression refrigeration System
   a) After compression b) Before compression
   c) Before throttling d) After throttling

10. A vapour absorption refrigerator uses water and _____ mixture as a refrigerant

PART B (10 x 2 = 20 Marks)

(Not more than 40 words)

11. What is meant by thermodynamics system? How do you classify it?
12. Define Intensive and Extensive properties.
13. Define compression ratio.
14. What is knocking?
15. What is meant by FAD?
16. What are the air standard assumptions taken into consideration during gas cycle analysis?
17. Define COP of refrigeration.
18. What are the disadvantages of air refrigeration system?
19. Mention any two desired properties of refrigerants
20. State Stefan-Boltzmann law

PART C (5 x 14 = 70 Marks)

(Not more than 400 words)

Q.No. 21 is Compulsory

21. Air at a temperature of 20°C passes through a heat exchanger at a velocity of 40 m/s where its temperature is raised to 850°C. It then enters a turbine with the same velocity of 40 m/s and expands until the temperature falls to 600°C. On leaving the turbine, the air is taken at a velocity of 65 m/s to a nozzle where it expands until the temperature has fallen to 450°C. If the air flow rate is 2 kg/s, calculate

    (a) The rate of heat transfer to the air in the heat exchanger

    (b) The power output from the turbine assuming no heat loss

    (c) Velocity at the exit from the nozzle assuming no heat loss. Take the enthalpy of air as h=CpT .where Cp=1.005 kJ/kgK.

22. a) An engine working on the Otto cycle is supplied with air at 0.3Mpa, 40^{O}C. The compression ratio is 9. Heat supplied is 1900kJ/kg. Calculate the maximum pressure and temperature of the cycle, the cycle efficiency, and the mean effective pressure. Assume air is an ideal gas.

(OR)

b) Derive the thermal efficiency of the Brayton cycle with Regenerator.

23. a) Derive the Area velocity relation for an isentropic flow through a nozzle and discuss the relation for both subsonic and a supersonic flow.

(OR)

b) Sketch the P-v diagram and T-s diagrams for a diesel cycle. Derive the thermal efficiency and mean effective for the same.

24. a) Derive an expression for the optimum intermediate pressure of two stage reciprocating compressor with perfect intercooling and also show its P-vdiagram.

(OR)

b) Derive the one dimensional steady state heat conduction equation for a plane and composite wall with appropriate assumptions.

25. a) With neat sketch, explain the working of a summer air conditioning system.

(OR)

b) Explain the vapour compression refrigeration cycle with a neat sketch.

****