## 2008-PUNJAB TECHNICAL UNIVERSITY
### B.TECH I SEMESTER REGULAR EXAMINATION
### THERMAL SCIENCE
### (MECHANICAL ENGINEERING)

TIME-3HOUR
MARKS-80

### ANSWER ANY FIVE QUESTIONS ALL QUESTIONS CARRY EQUAL MARKS

**MARKS [16*5=80]**

1. (a) Why does free expansion have zero work transfer?

(b) How do the terms energy content and energy transfer differ from each other?

(c) A gas expands according to the equation PV = 1000, Where P is the pressure in KPa and V is the specific volume, in m3/kg. If the gas pressure drops from 1000 to 500 KPa, how much work done by the gas.

2. A steam turbine operates under steady flow conditions. Steam at inlet to turbine is at 15 bar with internal energy 2700 KJ/kg; specific volume 0.17 m3 / kg and velocity 100 m/s. The exhaust of steam from the turbine is at 0.1 bar with internal energy 2175 KJ/kg, specific volume 15 m3/kg and velocity 300 m/s. The intake is 3 meters above the exhaust. The turbine develops 35 kW and heat loss over the surface of the turbine is 20 KJ/kg. Determine the steam flow rate through the turbine.

3. (a) State and explain

i. Kelvin - Planck Statement of IInd Law of thermodynamics

ii. Clausius statement of IInd Law of thermodynamics

(b) An engine is to be designed to produce 0.735KW by taking continuously 6000kJ/h from heat source which is at 505K. The heat sink is atmosphere i.e., sink temperature is atmospheric. Calculate the efficiency of car not cycle. The atmospheric temperature varies from 380C in summer and 00c in winter. Comment on the performance of the engine

4. (a) Derive an expression for mean effective pressure of the Otto Cycle?

(b) An air standard dual cycle has a compression ratio of 16, and the compression begins at 1 bar, 500C. the maximum pressure is 70 bar. The heat transferred to air at constant pressure is equal to that at constant volume. Estimate

i. The pressure and temperature at the cardinal points of the cycle.

ii. The cycle efficiency

iii. The m.e.p. of the cycle.

5. A refrigerator working on bell ? Coleman cycle operates between pressure limits of 1.05 bar and 8.5 bar. Air is drawn from the cold chamber at 100 C, compressed and it is cooled to 300 C before entering the expansion cylinder. The expansion and compression follows the law pv1.3 = constant. Determine the theoretical C.O.P of the system.

6. (a) How the C.I. engine fuels are rated? Explain the required qualities of C.I. engine fuels.

(b) How to control the speed variations in C.I. engine? Explain.

7. (a) What are main functions of carburetor in S.I. Engine?

(b) Describe the working principle of simple carburetor with suitable diagram.

8. (a) What are the major applications of gas turbine cycle? Explain

(b) What are the advantages and limitations of reheating gas turbine cycle with multi-stage expansion.