

II B.Tech II Semester Supplementary Examinations, April/May 2005
THERMAL ENGINEERING & HEAT TRANSFER
(Common to Mechatronics and Production Engineering)

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

1. (a) With the help of p-V and T-s diagram explain Otto cycle clearly showing the process during which heat is supplied and rejected.
 (b) In a Carnot cycle, the maximum pressure and temperature of the cycle are 17.5 bar and 175°C. The isothermal expansion ratio is 2. Calculate the thermal efficiency, work done and mean effective pressure.
2. (a) Describe the important qualities of a CI engine fuel.
 (b) Briefly describe the rating of CI engine fuel.
3. (a) Why cooling of an I.C engine is necessary?
 (b) What are the various types of radiators? Is the name 'radiator' correct? Sketch the tube and fin arrangements in these radiators.
4. (a) Give a brief account of the injection in S.I. engine.
 (b) With sketches explain the possible locations of the injection nozzle in S.I. engines.
5. (a) Sketch a line diagram of a semi-closed gas turbine cycle. Indicate its place of operation.
 (b) Discuss the relative advantages and disadvantages of reciprocating I.C.engines and gas turbines.
6. Prove that the heat loss per square metre of outside surface area of a hollow sphere heated from within is equal to

$$q = \frac{2k(T_1 - T_2)}{(D_2 - D_1) \frac{D_2}{D_1}}$$
 where T_1 and T_2 are the temperatures and D_1 and D_2 are the diameters of the inner and outer surfaces respectively.
7. The parallel outer and inner walls of a building are 4m high and 5m long. The walls are 10 cm apart. The inner surface of the inner wall is at 25°C and the inner surface of the outer wall is at 5°C.
 (a) Calculate the total heat loss per hour.
 (b) If the air space is divided in half by a sheet of aluminium foil 0.025 mm thick parallel to the walls, what would be the heat loss per hour.
8. (a) Explain the difference between monochromatic emissive power and the total emissive power of a blank body.

- (b) Determine the heat lost by radiation per meter length of a 8 cm diameter pipe at $300^{\circ}C$ if it is
- located in a large room with red brick walls at a temperature of $27^{\circ}C$ and
 - enclosed in a 16 cm diameter red brick conduit at a temperature of $27^{\circ}C$.
Given emissivity of steel pipe as 0.79 and emissivity of brick conduit as 0.93.
