Applied Thermodynamics-II
(ME-210, DEC 2006)

Time: 3 Hrs
Max Marks: 60

Note: Section A is compulsory. Attempt any four questions from section B and any two from Section C.

Section-A
1. a) Sketch a typical valve timing diagram of a four stroke diesel engine.
    b) What is meant by ignition delay period?
    c) Explain what is work input factor in centrifugal compressors?
    d) Explain the advantages of Ram jet propulsion system.
    e) List the positive displacement type compressors of rotary design.
    f) Give comparison between reciprocating and rotary air compressors.
    g) Mentions methods for improvement of thermal efficiency of open cycle gas turbine plant.
    h) List out merits of gas turbine over steam turbine.
    i) Give the classification of rotary compressors.
    j) Write the effects of supercharging on performance of I.C. engines.

Section-B
2. List out the factors affecting the flame propagation in S.I. engine & explain briefly.
3. What are the requirements of C.I. combustion chamber for diesel engines?
4. Explain the phenomenon of surging and choking in centrifugal compression.
5. State merits and demerits of closed cycle gas turbine over open cycle.
6. Give the advantages and disadvantages of jet propulsion over other system.

Section-C
7. The following data apply to a gas turbine cycle.
    Ambient temperature = 27ºC
    Highest cycle temperature = 827ºC
    Inlet pressure = 1 bar
    Pressure ratio = 4
    Compressor efficiency = 82 %
    Turbine efficiency = 85%
    Calorific value of fuel = 41 MJ/kg
    Combustion Efficiency = 90%
    Determine specific output, thermal efficiency and specific fuel consumption.
8. A jet propulsion unit uses 35 kg of air per second when flying at 800 km/hr. The air is compressed from 15ºC and 1 bar to 182ºC and 309 bar. The temperatures of gases entering and leaving the turbine are 815ºC and 650ºC and then it enters into the nozzle. Assuming the isentropic efficiency of compressor and turbine is same and nozzle efficiency 90%. Neglecting the effect of ramming and fuel mass, find the following.
    (i)   Isentropic efficiency of compressor and turbine
    (ii)   Power required to sun the compressor and
    (iii)   Thrust produced
9. Explain the phenomena of knocking in S.I. engine. What are the different factors which influence the knocking and methods of suppress it?