

**II B.Tech II Semester Supplementary Examinations,
November/December 2005
THERMAL ENGINEERING-I
(Mechanical Engineering)**

Time: 3 hours**Max Marks: 80**

**Answer any FIVE Questions
All Questions carry equal marks**

1. (a) Give complete classification of i.c. engines.
(b) Explain with a neat sketch the construction details of i.c. engine mechanism and name the principal components. [16]
2. (a) How can be the possibility of detonation be reduced at the design stage in S.I. engines.
(b) Explain the desirable point in the cycle to obtain the peak pressure and discuss its importance. [16]
3. (a) what causes the knock in a CI engine? In which part of the combustion process (beginning or the end) does it occur?
(b) Explain and discuss the phenomenon of diesel knock in C.I engines and compare the same with detonation in S.I engines.
(c) How do the injection timing and the fuel quality affect the engine knock? [4+8+4]
4. A six cylinder, four stroke cycle marine oil engine has cylinder diameters of 610 mm and a piston stroke of 1250 mm. When the engine speed is 120 rpm it uses 340 kg of fuel oil of calorific value 44.2 MJ / kg in one hour. The cooling water amounts to 19200 kg / h, entering at 15°C and leaving at 63°C. The torque transmitted at the engine couplings is 108 k N-m and the indicated mean effective pressure is 775 kPa. Determine
 - (a) the ip,
 - (b) the bp,
 - (c) the mechanical efficiency,
 - (d) bmep
 - (e) brake thermal efficiency
 - (f) the percentage of energy supplied per kg of fuel lost to the cooling water,
 - (g) the fuel used per kWh on a brake power basis. [16]
5. (a) State the uses of compressed air in engineering
(b) Working from first principles, derive an expression for work done on air in a reciprocating compressor in terms of the pressure ratio. [6+10]

6. (a) What is “slip factor”? What is its effect on the flow and the pressure ratio in the stage? [5+5]
(b) Compare the merits and demerits of axial flow compressors and centrifugal compressor. [6]
7. In an open type air refrigeration 550 kg of air is circulated per hour. The air is drawn from the cold chamber at 3°C at atmospheric pressure and compressed isentropically to 5 bar absolute. It is then cooled to 20°C at the same pressure. Air is then led to expander where it is expanded isentropically down to atmospheric pressure and is discharged to cold chamber. Calculate
(a) heat extracted from cold chamber,
(b) Heat rejected to cooling water per hr and
(c) COP of the system. [16]
8. (a) Discuss the essential properties of an ideal refrigerant?
(b) Name various psychrometric processes and show each of them on psychrometric chart? Which of these properties is most suitable in summer? [8+8]
