



B.E / B.Tech. (Full Time) DEGREE END SEMESTER EXAMINATIONS, NOV/ DEC 2012

MECHANICAL ENGINEERING BRANCH

FOURTH SEMESTER

ME 9254 – THERMAL ENGINEERING I

(REGULATIONS 2008)

Time: 3 hr

Max Mar: 100

Answer ALL Questions

PART – A (10 x 2 = 20 Marks)

1. What is an air-standard cycle? Why such cycles are conceived?
2. Define the terms Compression ratio, Expansion ratio and Cut-off ratio.
3. Define Volumetric efficiency, Isothermal efficiency and Isentropic efficiency of a reciprocating compressor.
4. What do you mean by perfect intercooling?
5. Draw an actual PV diagram of a SI engine indicating all the processes.
6. What is the function of piston, connecting rod, crankshaft and flywheel?
7. Distinguish between petrol and diesel engine.
8. Define Knocking.
9. What methods are adopted for improving thermal efficiency?
10. What are the advantages of gas turbine over I.C. engine?

PART – B (5 x 16 = 80 Marks)

- 11 (a) An air standard dual cycle has a compression ratio of 16, and compression begins at 1 bar, 50°C. The maximum pressure is 70 bar. The heat transferred to air at constant pressure is equal to that at constant volume. Estimate (a) the pressures and temperatures at the cardinal points of the cycle. (b) the cycle efficiency and (c) the mean effective pressure of the cycle.

- 12 (a) A single cylinder reciprocating compressor has a bore of 120 mm and a stroke of 150 mm, and is driven at a speed of 1200 rpm. It is compressing a gas from a pressure of 120 KPa and a temperature of 20 °C to a temperature of 215 °C. Assuming polytropic compression with $n = 1.3$, no clearance and volumetric efficiency of 100%, calculate (a) pressure ratio, (b) indicated power (c) shaft power, with a mechanical efficiency of 80% (d) mass flow rate. If a second stage of equal pressure ratio were added, calculate (e) the overall pressure ratio and (f) the bore of the second stage cylinder, if the same stroke was maintained.

(Or)

- (b) A single-acting two-stage air compressor deals with 4 m³/min of air at 1.013 bar and 15 °C with a speed of 250 rpm. The delivery pressure is 80 bar. Assuming complete intercooling. Find the minimum power required by the compressor and the bore and stroke of the compressor. Assume a piston speed of 3 m/s, mechanical efficiency of 75% and volumetric efficiency of 80% per stage. Assume the polytropic index of compression in both the stages to be $n = 1.25$ and neglect clearance.

- 13 (a) Write the classification of IC engine and explain the functions of each components of IC engine with neat sketch.

(Or)

- (b) Compare the two stroke and Four stroke engines. Also discuss about the actual and theoretical valve timing, port timing and PV diagrams.

- 14 (a) Explain how knocking occurs in SI engine and various factors affecting knocking in SI engine.

(Or)

- (b) Explain the functions and working of lubrication and cooling systems used in IC engine.

- 15 (a) Describe with neat sketch the working of a simple constant pressure open cycle gas turbine and discuss the factors responsible for the lower overall efficiency.

(Or)

- (b) Discuss about the various methods adopted in improving efficiency of the gas turbine cycle.