

MODEL QUESTION PAPER
FOURTH SEMESTER BTECH INDUSTRIAL ENGINEERING
13.406 THERMAL ENGINEERING

TIME : 3 hours

MARKS: 100

ANSWER ALL QUESTIONS FROM PART A AND EACH QUESTION CARRIES 4 MARKS.

ANSWER ONE FULL QUESTION OUT OF THE TWO FROM EACH MODULE AND EACH QUESTION CARRIES 20 MARKS

USE OF TABLES AND CHARTS ARE PERMITTED

PART A

1. Explain supersaturated flow in nozzle with the help of h-s and T-s diagrams.
2. Make a comparative study between two stroke and four stroke engines
3. Draw and describe a semi-closed cycle gas turbine unit.
4. Compare the rotary compressors with the reciprocating compressors.
5. Write a short note about comfort and industrial air conditioning (5 x 4 = 20 marks)

PART B

Module-I

6. A steam plant operating on Rankine cycle generates superheated steam at 10 bar and 380^o C. Condensation occurs at 0.06 bar. Using steam tables only, calculate the thermal efficiency of the plant and compare this with the thermal efficiency of a carnot cycle working between the same extremes of temperatures. What change in Rankine efficiency is incurred by raising the steam temperature from saturation temperature?
7. With the help of a neat diagram, explain a high pressure boiler.

Module- II

8. Derive the air standard efficiency for a diesel cycle and express diesel and otto cycles in pv and Ts diagrams
9. Explain the following (i) Abnormal combustion in SI engines (ii) CRDI (iii) GDI (iv) MPFI

Module- III

10. Prove that the isothermal compression of air in an air compressor requires the minimum work input to drive it.
11. In a gas turbine plant air enters the compressor at 100 kN/ m² and 15^o C. The pressure ratio is 5:1. The temperature of gas at the inlet of the turbine is 800^o C. The mass flow rate is 10 kg/s.

Calculate (i) the compressor power and the turbine power. (ii) the ratio of turbine work to compressor work. (iii) the thermal efficiency

Module- IV

12. Explain the following (i) Fourier law (ii) Planks law (iii) Kirchoffs law (iv) Stefan Boltzmann law

13. (a) Explain vapor compression refrigeration system with the help of TS and PH diagrams.

(b) Explain a typical room air conditioner