

Reg. No. :

Name :

Fourth Semester B.Tech. Degree Examination, February 2015
(2008 Scheme)

Branch : MECHANICAL ENGINEERING
08.405 – Thermal Engineering (MU)
(Special Supplementary)

Time : 3 Hours

Max. Marks : 100

N.B. : Use of Steam Table and Mollier Chart are Permitted

PART – A



Answer all questions.

1. State the methods of improving thermal efficiency of a steam power plant working on Rankine cycle.
2. Discuss the advantages of water tube boilers over fire tube boilers.
3. Explain choked flow of a nozzle.
4. Discuss the advantages of using regenerative feed heating in a steam power plant.
5. Can alcohol be used for CI engines ? Explain.
6. "Spark ignition engines cannot burn very lean fuel air ratio but compression ignition can". Discuss.
7. Compare the open combustion chamber with divided combustion chamber for CI engines.
8. Why constant pressure heat addition is more advantageous in a gas turbine ?
9. Draw the velocity diagrams of an axial flow compressor.
10. Discuss the effect of impeller blade shape on performance of centrifugal compressor.

(4×10=40 Marks)

PART - B

Module - I

11. a) Explain the working of a high pressure steam boiler.
- b) State the advantages of regenerative cycle over simple rankine cycle.
- c) Derive the condition for maximum discharge of steam through a nozzle.

OR

12. a) What are the advantages and disadvantages of reheating ?
- b) Compare rankine cycle and carnot cycle.
- c) A simple Rankine cycle works between pressures 28 bar and 0.06 bar, the initial condition of steam being dry saturated. Calculate the cycle efficiency, work ratio and specific steam consumption.

Module - II

13. a) Calculate the theoretical air-fuel ratio for the combustion of octane.
- b) What do you meant by rich and lean mixtures ?
- c) Draw the schematic diagram of a simple cycle gas turbine with a heat exchanger and explain the working principle. Draw also the p-v and T-s diagrams of the cycle.

OR

14. a) Briefly explain the effect of various engine variables on SI engine knock.
- b) The efficiencies of the compressor and turbine of a gas turbine are 70.42 % and 71% respectively. The heat added in the combustion chamber per kg of air is 476.354 kJ/kg. Find a suitable pressure ratio such that the work ratio is 0.0544.

Also find the corresponding temperature ratio. The inlet total temperature of air 300K.



Module - III

15. a) Describe the function of the impeller and diffuser in a centrifugal compressor with the help of sketches and pressure and velocity variation of air passing through impeller and diffuser.
- b) A single stage single acting reciprocating compressor delivers 150m^3 of free air per minute, compressing it from 1 bar to 8 bar. The speed of the compressor is 300 rpm. If the clearance is one-sixteenth ($1/16$) of swept volume, find the diameter and stroke of the compressor. Take $L/D = 1.5$, where L is stroke and D is bore. The value of n can be taken as 1.3.

OR

16. a) With the help of neat sketches, explain a roots air blower. How its p-v diagram is different from a reciprocating air compressor ?
- b) Plot and discuss the characteristics of centrifugal and axial flow compressors.

(20×3=60 Marks)