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Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2014

Sixth Semester

Branch : Mechanical Engineering

ME 010 603—THERMAL SYSTEMS AND APPLICATIONS (ME)

(New Scheme—2010 Admission onwards)

[Regular/Improvement/Supplementary]

Time : Three Hours

Maximum : 100 Marks

Part A

*Answer all questions.
Each question carries 3 marks.*

1. Differentiate between Enthalpy and Internal energy.
2. What do you mean by super saturated flow ?
3. What is the need of inter-cooling in gas turbines ?
4. Define overall loss coefficient for a collector.
5. List the features of a coal burner.



(5 × 3 = 15 marks)

Part B

*Answer all questions.
Each question carries 5 marks.*

6. What are boiler accessories ? Explain.
7. Derive an expression for work done in a steam turbine.
8. Discuss the losses during a combustion process. What is a stability loop ?
9. How will you quantify the useful heat gained by a fluid ?
10. Discuss the concept of draught and its types.

(5 × 5 = 25 marks)

Turn over

Part C

*Answer all questions.
Each question carries 12 marks.*

11. What is a Rankine cycle? Draw its T-S and P-V diagrams. Modify it for wet, dry and superheated steam. Derive the expressions for the performance of the plant.

Or

12. A steam power station uses the following cycle: Steam at boiler outlet-150 bar, 550°C, Reheat at 40 bar to 550°C, condenser at 0.1 bar. Using the Mollier chart and assuming ideal processes, find the (a) quality at turbine exhaust, (b) cycle efficiency, and (c) Steam rate.
13. Explain the working of a steam nozzle. What is the significance of mass flow rate? Derive the condition of throat pressure for maximum discharge.

Or

14. Explain the velocity triangles, work generated and governing of a steam turbine. What is the role of a steam turbine in a power plant.
15. In a gas turbine plant, working on the Brayton cycle with a regenerator of 75% effectiveness, the air at the inlet to the compressor is at 0.1 MPa, 30°C, the pressure ratio is 6, and the maximum cycle temperature is 900°C. If the turbine and compressor have each an efficiency of 80%, find the percentage increase in cycle efficiency due to regeneration.

Or

16. Discuss the different types of combustion chambers in gas turbines. Discuss the concept of combustion intensity and combustion efficiency.
17. Discuss the focusing type solar collectors, solar concentrators and solar receivers. Discuss the principle and working with schematic diagrams.

Or

18. Explain the optical losses, thermal performance and power generation using solar energy-based systems.
19. A cyclic steam power plant is to be designed for a steam temperature at turbine inlet of 360°C and an exhaust pressure of 0.08 bar. After is entropic expansion of steam in the turbine, the moisture content at the turbine exhaust is not to exceed 15%. Determine the greatest allowable steam pressure at the turbine inlet, and calculate the Rankine cycle efficiency for these steam conditions. Estimate also the mean temperature of heat addition.

Or

20. Explain in detail, the layout and operation of diesel power plant.

(5 × 12 = 60 marks)