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Question Paper Code : R 3768

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2009.

Third Semester

Mechanical Engineering

ME 231 — APPLIED THERMODYNAMICS

(Regulation 2001)

Time : Three hours

Maximum : 100 marks

Use of approved Steam and Refrigeration tables and charts permitted.

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the various types of nozzles and their functions?
2. What are the factors responsible for supersaturated flow in a steam nozzle?
3. What are the advantages of multistage compression?
4. Classify the various types of air-compressors.
5. What is the name of the process of heat addition in Diesel cycle?
6. Name the cycle on which a gas turbine works.
7. What is the purpose of reheating in steam plant?
8. List the characteristics of a working fluid most suitable for vapour power cycles.
9. What are the expansion devices used in vapour compression plant?
10. List the important industrial and commercial applications of refrigeration.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Define critical pressure and critical temperature ratios of a nozzle. (6)
- (ii) Dry saturated steam at 10 bar is expanded in a nozzle to 0.4 bar. The throat area is 7 cm² and the inlet velocity is negligible. Determine the mass flow and the exit area. Assume isentropic flow and take the index $n = 1.135$ for dry saturated steam. (10)

Or

- (b) Derive the condition for maximum discharge through steam nozzle. (16)
12. (a) Discuss the merits and demerits of rotary and reciprocating compressors. (16)

Or

- (b) With the help of schematic and p-V diagrams, explain the working of a vane type compressor. (16)
13. (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 the cycle efficiency and mean effective pressure of the cycle. (16)

Or

- (b) (i) Explain a Diesel cycle. (6)
- (ii) Derive an expression for the thermal efficiency of an ideal diesel cycle. (10)
14. (a) Explain briefly the Mercury – Water binary vapour cycle with the help of a schematic and T-s diagrams. (16)

Or

- (b) In a steam power plant, the condition of steam of inlet to the steam generator is 20 bar and 300°C and the condenser is 0.1 bar. Two feed water heaters at optimum temperature are used. Determine the quality of steam at turbine exhaust, cycle efficiency and the steam rate. (16)
15. (a) Discuss the advantages and disadvantages of vapour absorption refrigeration system over vapour compression system. (16)

Or

- (b) With a neat sketch, discuss briefly the ammonia absorption refrigeration cycle. (16)