Reg. No. : | | | | | | | | | | | |

D 4241

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2008.

Fourth Semester

Electrical and Electronics Engineering

ME 1211 — APPLIED THERMODYNAMICS

(Common to Electronics and Instrumentation Engineering and Instrumentation and Control Engineering for candidates admitted in 2006 only)

(Regulation 2004)

Time : Three hours | Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. State the first law of thermodynamics.

2. Give the following statement of the second law of thermodynamics

   (a) Clausius statement

   (b) Kelvin Plank statement.

3. Mention the classification of an IC engine.

4. State the methods of improving the thermal efficiency of open cycle gas turbine.

5. State the difference between boiler mounting and boiler accessories.

6. How are steam turbines classified?

7. Enumerate the application of an air compressor.

8. State the various systems of refrigeration.

9. What do you mean by critical thickness of insulation?

10. Define radiation shape factor.

PART B — ($5 \times 16 = 80$ marks)

11. (a) Air flows steadily at the rate of 0.5 kg/s through an air compressor, entering at 7 m/s velocity, 100 kPa pressure and 0.95 m^3/kg and leaving at 5m/s 700 kPa and 0.19 m^3/kg. the internal energy of air leaving is 90 kJ/kg greater than that of air entering cooling water in the compressor jacket absorb heat at the rate of 5 kW. Compute the rate of shaft work input in kW, and find the ratio of inlet to outlet pipe diameter. (16)

Or

(b) A cyclic heat engine operate between a source temperature of 800 C and sink temperature of 30 C, what is the rate of heat rejection per kW net output of an engine. (16)

12. (a) An engine of 250 mm bore and 375 mm stroke works on Otto cycle, the clearance volume is 0.0025 m^3 the inlet pressure and temperature are 1 bar and 50 C. if the maximum pressure is limited to 25 bar. Calculate

(i) air standard efficiency of the cycle

(ii) Mean effective pressure. (16)

Or

(b) (i) What are the limitations of gas turbine? (6)

(ii) Explain the merits of gas turbine. (10)

13. (a) Explain with neat sketches the construction and working of

(i) LaMont boiler and

(ii) Benson boiler. (16)

Or

(b) With a neat sketch explain the principal methods of steam turbine governing. (16)

14. (a) A single stage reciprocating air compressor takes 1 m^3 of air per minute at 1.013 bar and 15 C and delivers at 7 bar. Assuming that the law of compression is $PV^{1.25} = C$ and the clearance is negligible, calculate the indicated power. (16)

Or

(b) Describe a simple vapour compression refrigeration system and mention its advantages. (16)

15. (a) Assuming the sun to radiate as a black body, calculate its temperature from the data given below. The average radiant energy flux incident upon the earth's atmosphere is 1350 W/m^2. Radius of the sun is 7×10^8 m. distance between the earth and sun is 15×10^{10} m. (16)

Or

(b) Determine the heat transfer through the plane of length 6 m, height 4 m, and thickness 0.30 m. the temperature of inner and outer surfaces are 100 C and 40 C.thermal conductivity of the wall is 0.55 W/mK. (16)