Register No.:

214

October 2017

Time – Three hours]
[Maximum Marks: 75

[N.B: (1) Q.No. 8 in PART – A and Q.No. 16 in PART – B are compulsory. Answer any FOUR questions from the remaining in each PART - A and PART - B.

(2) Answer division (a) or division (b) of each question in PART-C.

(3) Each question carries 2 marks in PART – A, 3 marks in Part – B and 10 marks in PART – C.

(4) Use of steam tables are permitted.]

PART – A

1. State Clausius statement of second law of thermodynamics.
2. What is meant by irreversible cycle?
3. Write the expression for the theoretical minimum mass of air required for complete combustion of 1 kg of a fuel.
4. Define dryness fraction and wetness fraction of steam.
5. What are the uses of compressed air?
6. Define saturated air and dry bulb temperature.
7. Mention the important components of a room air conditioner.
8. What are the essential elements of a steam condensing plant?

PART – B

9. State the three types of thermodynamic systems with examples.
10. State and explain the Zeroth law of thermodynamics.
11. What are the requirements of a good fuel?
12. Draw the P-V and T-S diagrams of the Otto cycle and indicate various processes.
13. Mention the factors to be considered in the selection of a steam boiler.
14. Explain the working of an axial flow compressor with neat sketch.
15. What are the factors to be considered in air conditioning for human comfort?
16. Mention any three applications of refrigeration.

PART – C

17. (a) (i) State the laws of perfect gas.
    (ii) A gas is compressed isothermally from 200kN/m² and 0.058m³ to a volume of 0.004m³. Determine (1) final pressure (2) work done and (3) heat transferred.

[Turn over...

(Or)

(b) A gas is expanded adiabatically from 700kN/m² and 0.015m³ to 140kN/m². Determine (i) final volume (ii) work done (iii) change in internal energy (iv)heat transferred and (v)change in entropy. Take C_P=1.046kJ/kgK and C_V=0.752kJ/kgK.

18. (a) (i) A Carnot engine working between 650K and 310K produces 150kJ of work. Find (1) thermal efficiency and (2) heat added during the process.

(ii) Calculate the air standard efficiency of Diesel cycle having the compression ratio 18 and expansion ratio 10.

(Or)

(b) Explain how the calorific value of a fuel is determined using Bomb calorimeter.

19. (a) Determine the specific volume, enthalpy, entropy, external work of evaporation and internal energy of steam at 8 bar and 95% dry.

(Or)

(b) (i) Draw and explain the actual indicator diagram of a steam engine.

(ii) Explain the working of a surface condenser with a neat sketch.

20. (a) Explain the working of a four stroke petrol engine with neat sketches.

(Or)

(b) The following results were obtained during a test on a four cylinder four stroke oil engine.
Bore-100mm, stroke-115mm, speed-1650rpm, fuel used-0.2kg/minute, calorific value of fuel-41900kJ/kg, net load on the brake drum-390N, circumference of the brake drum-3.3m, mechanical efficiency-80%
Determine (i) brake power (ii) indicated power (iii) brake thermal efficiency and (iv) indicated thermal efficiency.

21. (a) A refrigerating plant is required to produce 2.5 tonnes of ice per day at –4°C from water at 20°C. If the temperature range in the compressor is between 25°C and –6°C, calculate the power required to drive the compressor. Latent heat of ice=336kJ/kg and specific heat of ice=2.09kJ/kgK.

(Or)

(b) Enumerate the various loads encountered in air conditioning system.
