105 Register No.:

October 2018

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. What is intensive property? Give an example.
2. State the effect of cut off ratio on efficiency of Otto cycle.
3. State the significance of excess air.
4. Define dryness fraction.
5. State the types of surface condenser.
6. Define mechanical efficiency.
7. Define refrigerating effect.
8. State Newton's first law of motion.

PART – B

9. Derive an expression for work done during constant pressure process.
10. 0.9 kg of air at a pressure of 15 bar and a temperature of 250°C expanded adiabatically to a pressure of 1.5 bar. Determine the work done. Take R=0.287 kJ/kgK; γ=1.4.
11. Draw P-V and T-S diagram of a Diesel cycle and indicate various processes.
12. What are the merits and demerits of jet condensers?
13. What are the main features of high pressure boilers?
14. In a test on Diesel engine, the specific fuel consumption was 260 g/kW-hr. The calorific value of the fuel is 42,000 kJ/kg. Determine the brake thermal efficiency.

[Turn over.....

15. Mention any three desirable properties of a refrigerant.

16. Compare two stroke and four stroke petrol engine.

PART – C

17. (a) (i) Derive the relationship between C_p, C_v and R.
(ii) A gas Is compressed hyperbolically from a pressure and volume of 100 kN/m² and 0.056 m³ respectively to a volume of 0.007 m³. Determine the final pressure and the work done.

(Or)

(b) 0.5 kg of air at 180°C expands adiabatically to 3 times its original volume. During the expansion the temperature is decreased to 20°C. Work done during expansion is 53 kN.m. Find C_p, C_v and R.

18. (a) An Otto cycle has a compression ratio of 7 and works between the temperature limits 300K and 1430K. Determine the maximum power developed when the working fluid is used at the rate of 0.4 kg/min. Also determine the temperature at the end of compression. Take $\gamma = 1.4$; $C_v = 0.718\ kJ/kgK$.

(Or)

(b) A fuel has the following analysis by weight: Carbon=86%; Hydrogen = 10%; Oxygen=1%; Sulphur=1%; Remaining ash.
If 50% excess air is supplied, find (i)Total amount of air supplied (ii)Gravimetric analysis of exhaust gas.

19. (a) Describe the method of finding the dryness fraction of steam by barrel calorimeter.

(Or)

(b) Describe with a neat sketch, the construction and working of Lamont boiler.

20. (a) (i) Compare Petrol engine and Diesel engine.
(ii) Explain the working of a centrifugal compressor with a neat sketch.

(Or)

(b) During a test on a four stroke oil engine, the following data were obtained:
Swept volume of the cylinder = 14 litres
Speed of the engine = 6.6 revolution per second.
Effective brake load = 77 kg
Effective brake radius = 0.7m
Indicated mean effective pressure = 567 kN/m².
Determine: (i)Indicated power (ii)Brake power (iii)Mechanical efficiency.

21. (a) A perfect reversed heat engine is used for making ice at −5°C from water at 20°C. The temperature of brine or freezing mixture is −10°C. Calculate the quantity of ice formed per kW-hr. For ice, specific heat is 2.1 kJ/kgK and latent heat is 336 kJ/kg.

(Or)

(b) (i) Define: (i)Wet bulb temperature (ii)Dry bulb temperature (iii)Dew point temperature.
(ii) Enumerate the various loads encountered in air conditioning system.
