1871

Code : 15AT31T

Register Number

HEAT POWER ENGINEERING

Time : 3 Hours]   [Max. Marks : 100

Instruction : (i) Answer any **six** questions from PART – **A**. Each questions carries **5** marks.

(ii) Answer any **seven** questions from PART – **B**. Each questions carries **10** marks.

(iii) Any missing data may be suitably assumed.

PART – A

1. Distinguish between closed system and open system.   5

2. Distinguish between mechanical equilibrium and thermal equilibrium.   5

3. State Boyle's law and Charles's law.   5

4. Derive an expression for general gas equation.   5

5. Define thermodynamic process and list out the types of thermodynamic processes.   5

6. Derive an expression for work done during constant pressure process.   5

7. What is a thermodynamic cycle ? State clearly the assumptions made.   5

8. Define fuel and state chief combustible elements of fuel.   5

9. What are the effects of Detonation or knocking in S.I. Engine.   5

[Turn over

PART – B

10. Explain Zeroth law and first law of thermodynamics.   10

11. (a) What do you mean by property of a system ? Distinguish between extensive and intensive properties of a system.   5

    (b) Represent Diesel cycle on P-V and T-S diagram.   5

12. A mass of 2.25 kg of nitrogen occupying 1.5 m^3 is heated from 25 °C to 200 °C at a constant volume. Calculate the initial and final pressures of the gas. Take universal gas constant as 8314 J/kg·mol·K. The molecular mass of nitrogen is 28.   10

13. 0.1 m^3 of air at a pressure of 1.5 bar is expanded isothermally to 0.5 m^3. Calculate the final pressure of the gas and heat supplied during the process.   10

14. A certain gas occupies a space of 0.3 m^3 at a pressure of 2 bar and a temperature of 77 °C. It is heated at a constant volume until the pressure is 7 bar. Determine temperature at the end of the process, mass of the gas, change in internal energy and change in enthalpy during the process. Assume C$_p$ = 1.005 kJ/kg K, Cv = 0.712 kJ/kg K and R = 287 J/kg K.   10

15. Explain with P-V and T-S diagram the working of Otto cycle.   10

16. A Carnot engine operates between two reservoirs at temperatures T$_1$ and T$_3$. The work output of the engine is 0.6 times the heat rejected. The difference in temperature between the source and the sink is 200 °C. Calculate the thermal efficiency, source temperature and the sink temperature.   10

17. (a) Explain the conversion of volumetric analysis into mass analysis.   5

    (b) Which are the controlling methods of detonation in S.I. engine.   5

18. With a neat sketch, explain the bomb calorimeter used to calculate the calorific value of a fuel.   10

19. With the help of P-O diagram, explain the stages of combustion in C.I. engine.   10

————————