1953

Code : 15AT31T

Register Number | | | | | | | | | | |

III Semester Diploma Examination, Nov./Dec. 2018

HEAT POWER ENGINEERING

Time : 3 Hours] **[Max. Marks : 100**

Instructions : (1) Answer any **six** questions from Part – **A** and each question carries **five** marks.

(2) Answer any **seven** questions from Part – **B** and each question carries **ten** marks.

(3) Any missing data may be suitably assumed.

PART – A

1. Define a thermodynamic system and mention different types. **5**

2. State Boyle's law and Charle's law. **5**

3. List any 5 different thermodynamic processes on gases. **5**

4. Represent Dual combustion cycle on P-V and T-S diagram. **5**

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

6. Define ignition lag. Mention the variables affecting ignition lag. **5**

7. Derive an expression for characteristic equation of a perfect gas. **5**

8. What are the effects of knocking in CI engine ? **5**

9. Explain the conversion of volumetric analysis into mass analysis. **5**

PART – B

10. Explain Zeroth and First law of thermodynamics.

11. Derive an expression for work done during an Isothermal process and show the process on P-V and P-T diagram.

12. (a) Prove that heat is a path function.

    (b) Explain with P-V and T-S diagram the working of Carnot cycle.

13. A vessel of capacity 3 m^3 contains air at a pressure of 2.0 bar and a temperature of 28 °C. Additional air is now pumped into the system until the pressure rises to 32 bar and temperature rises to 65 °C. Determine the mass of air pumped in and express the quantity as a volume at a pressure of 1.02 bar and temperature of 20 °C.

    If the vessel is allowed to cool until the temperature is again 28 °C, calculate the pressure in the vessel.

14. The values of C_p and C_v for an ideal gas are 984 J/kg.K and 728 J/kg.K. Find the values of characteristic gas constant and ratio of specific heats for the gas. If one kg of this gas is heated at constant pressure from 298 K to 473 K, estimate the heat added ideal work done and change in internal energy. Also calculate the pressure and final volume, if the initial volume was 2 m^3.

15. The initial volume of 0.20 kg of a certain gas was 0.2 m^3 at a temperature of 280 K and a pressure of 1 bar. After adiabatic compression to 0.060 m^3, the pressure was found to be 4 bar. Find, gas constant, molecular mass of the gas, ratio of specific heats, two specific heats and change in internal energy.

16. (a) An engine working on Otto cycle, has a cylinder diameter of 150 mm and stroke 200 mm. The clearance volume is assumed to be 8% of swept volume. Find the air standard efficiency. Take r = 1.4.

    (b) Show that for the same compression ratio of 8, the air standard efficiency of diesel cycle is less than the Otto cycle. The r = 1.4 and ρ = 2.5.

17. An engine working on the dual combustion cycle, has a compression ratio 11 and cut-off takes place at 08% of stroke. If the pressure at the beginning of compression is 1.2 bar and maximum pressure is 42 bar, determine the air standard efficiency of the cycle. Take r = 1.4. **10**

18. Sketch and explain the flue gas analysis using Orsat apparatus. **10**

19. With help of P-θ diagram, explain the stages of combustion in SI engine. **10**