(b) ... for determining the calorific value of a fuel.
(c) State the merits of liquid fuels.

6. (a) With the help of PV and T-S diagrams, derive an expression for the Air standard efficiency of an otto cycle.
(b) In an ideal diesel cycle, the compression ratio is 14 : 1 and the expansion ratio is 8 : 1. The pressure and the temperature at the beginning of the compression are 98 kN/m^2 and 42 °C respectively. Pressure at the end of expansion is 255 kN/m^2. Determine
(i) the maximum temperature attained during the cycle
(ii) the thermal efficiency of the cycle. Take $\gamma = 1.4$

7. (a) State the assumptions made in thermodynamic cycles.
(b) In an air standard otto. Cycle, the compression ratio is 6.5 and the compression begins at 1 bar and 313K. The heat added is 2520 kJ/kg. Find
(i) The maximum temperature and pressure of the cycle
(ii) Workdone per kg of air
(iii) Cycle efficiency
Take for air Cv = 0.713 kJ/kg K, R = 287 J/kg K.
(c) A carnot engine working between 655 K and 320 K produces 150 kJ of work. Find thermal efficiency and heat added during the process.

SECTION – IV

8. (a) Define :
(i) Superheated steam
(ii) Sensible heat of water
(iii) Latent heat of vapourisation
(b) Steam is generated at 8 bar from water at 32 °C. Find the heat required to produce 1kg of steam
(i) When dryness friction is 0.8
(ii) When steam is dry and saturated
(iii) When the steam is superheated and the temperature of steam is 300 °C. The specific heat of superheated steam may be taken as 2.3 kJ/kg K.

9. (a) Derive an expression for the change in internal energy, heat absorbed, worked one during adiabatic process as applied to steam.
(b) One Kg of steam at a pressure of 7 bar, 0.95 dry is expanded isothermally to a pressure of 1.5 bar. Find
(i) Change of enthalpy
(ii) Change of internal energy
(iii) Change of entropy
(iv) Heat transfer

10. (a) State the reasons for modifying Rankine cycle for operation of steam engines.
(b) Derive an expression for the efficiency of a carnot cycle using steam as working substance.
(c) In a steam power cycle, the steam is supplied at 15 bar and dry saturated. The condenser pressure is 0.4. Calculate the Rankine efficiency of the cycle using mollier chart.

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Number

IV Semester Diploma Examination, May 2012

MECHANICAL ENGINEERING BOARD

THERMAL ENGG. – I

me : 3 Hours] [Max. Marks : 100

tes : (1) Section – I is compulsory.

(2) Answer any two full questions from Sections – II, III & IV.

SECTION – I

(a) Fill in the blanks with appropriate word/words : 5 × 1 = 5

(i) The property of a system which is dependent on the mass is called _____ .

(ii) The change in internal energy during an isothermal process is _____ .

(iii) In a diesel cycle heat is rejected at _____ .

(iv) The point at which the latent heat of the steam becomes zero is called _____ .

(v) The work ratio of the rankine cycle as compared to carnot cycle is _____ .

(b) Explain reversible and irreversible process.

SECTION – II

(a) Define thermodynamic system. Explain its types.

(b) State the laws of intermodynamics.

(c) Write the steady flow and non flow energy equations with notations.

(a) Define :
(i) Gaylussac's law
(ii) Avagadro's law
(iii) Joule's law

(b) Derive the general gas equation.

(c) A mass of 3.5 kg. of nitrogen occupying 2 m^3 is heated from 25 °C to 195 °C at constant volume. Find the initial and final pressures of the gas. Take molecular weight of nitrogen as 28.

(a) What is isothermal process Derive an expression for the workdone during isothermal process.

(b) What is Throttling process ? Slate its characteristics.

(c) A gas initially at 600K expands until its volume is 5 times the initial volume according to $PV^n = C$. If the initial and final pressures are observed to be 8.4 bar and 1 bar, determine
(i) The index of expansion
(ii) Workdone per kg. of gas. Assume Cv = 0.712 kJ/kg and $\gamma = 1.4$.

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