MODEL QUESTION PAPER 1

4020340 – THERMAL ENGINEERING – I

[N.B: (1) Answer all the questions in part - A. Each question carries 3 marks.
(2) Answer either (A) or (B) of each questions in part -B. Each question carries 14 marks.]

PART – A

1. Define: Zeroth law of thermodynamics.
2. What is Free expansion and throttling processes?
3. Define: Air standard efficiency.
4. State the modes of heat transfer.
5. Define: control volume.
6. State any two properties of lubricant.
7. What is meant by excess air?
8. What are the requirements of good fuels?
9. State the types of refrigeration system.
10. What is dry bulb and wet bulb temperature?

PART – B

11. (a) (i) State and explain I and II law of thermodynamics. (6)
(ii) A gas whose pressure, volume and temperature 5 bar, 0.23 m^3 and 185°C respectively has changed its state at constant pressure until its temperature becomes 70°C. Determine a) Work done b) Change in internal energy c) The heat transferred during the process. Take R = 290 J/kg k and C = 1.005 KJ/Kg k. (8)

(OR)

(b) (i) 1 kg of gas expands isentropic ally and its temperature is observed to fall from 240°C to110°C while its volume is doubled. The work done by the gas is 90 KJ in the process. Determine C_p, C_v and R for the gas. (8)
(ii) 0.675 kg of gas at 14 bar and 280°C is expanded to four times the original volume according to law PV = C. Determine a) the initial and final volume of gas b) Final pressure and temperature of gas c) Workdone R= 287 J/Kg k. (6)

12. (a) (i) In an Otto cycle the pressure and temperature of the air at the beginning of compression are97KN/m^2 and 50°C respectively. The ratio of compression is 5:1. The heat supplied during the cycle is 970 kJ/kg of the working fluid. Determine (i) maximum temperature of the cycle,(ii) the thermal efficiency of the cycle and(iii) work done during the cycle per kg of working fluid. Assume y = 1.4 and C, 0.717 KJ/kg K. (8)
(ii) Discuss about the conduction heat transfer through a plane wall and Composite walls. (6)

(OR)

(b) (1) Find the power output of a diesel engine working on a standard diesel cycle with a compression ratio of 16 and air flow rate of 0.25 kg/s. The initial condition of air is at 1 bar pressure absolute and 27°C temperature. Heat added per cycle is 2500 kJ/kg. Assume C = 1.005 kJ/kg K and C, = 0.714 kJ/kg K (8)

(ii) Derive the steady flow energy equation and state the assumption made in the system analysis. (6)

13. (a) (i) Explain the working of four stroke petrol engine with a neat sketch. (8)

(ii) What are the different types of nozzles used in diesel engines? Explain anyone type. (6)

(OR)

(b) (i) Describe with a line diagram of coil ignition system and explain its working (7)

(ii) Explain the high pressure lubrication system with a line sketch. (7)

14. (a) (i) With a neat sketch, explain the method of determining the calorific value of gaseous fuels using Junker's gas calorimeter. (6)

(ii) In a boiler trial, the analysis of the coal by weight indicates as follows:
Carbon-60%; Hydrogen 4.5% ; Oxygen - 7.5%;Remaining ash. The dry flue gas has the following composition by volume CO_2 - 9%;Co-1%; N, -80%; 0,- 10%. Determine a) weight of the air supplied/kg of local burnt and b) Percentage of excess air. (8)

(OR)

(b) (i) The following results were obtained during a test on a four cylinder four stroke oil engine: Bore.100 mm, stroke - 115 mm, speed - 1650 rpm; fuel used 0.2 kg/min; calorific value of fuel 41900 kJ/kg: Net load on the brake drum 390N; Circumference of the brake drum 3.3m; Mechanical efficiency - 80%. Determine a) Brake thermal efficiency. b) Indicated thermal efficiency and c) Indicated mean effective pressure. (8)

(ii) Explain the Morse test for finding out the indicated power of a multi cylinder engine. (6)

15. (a) (i) With a neat flow diagram explain the working of a vapour absorption refrigeration system. (8)

(ii) A perfect reversed heat engine is used for making ice at-5°C from water available 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/kg K and latent heat is 336kJ/kg. (6)

(OR)

(b) (i) Name the psychometric process and explain any one process indicating the chart briefly. (6)

(ii) With the help of a line diagram, explain the working of a central air-conditioning plant. (8)

MODEL QUESTION PAPER 2

4020340 – THERMAL ENGINEERING – I

[N.B: (1) Answer all the questions in part - A. Each question carries 3 marks.
(2) Answer either (A) or (B) of each questions in part -B. Each question carries 14 marks.]

PART-A

1. What is the difference between Isothermal process and Adiabatic process
2. State the second law of Thermodynamics
3. Draw the P-V and T-S diagram Of Otto cycle and diesel cycle and indicate the Processes involved.
4. Write down the general Equation for (i) Turbine (ii)Condenser
5. Comparison between petrol And diesel engine.
6. Write short notes on (i)Connecting rod (ii) Piston (iii)Crank shaft
7. Determine the stoichiometric air required for complete combustion of 1 kg of coal whose analysis by mass is given below Carbon-78%; Hydrogen=3%; Oxygen- 3%; Sulphur -1%; Ash-10%; Moisture-5%
8. Define i) Mechanical efficiency ii) Brake thermal efficiency iii) Relative efficiency
9. Compare room air conditioner and central plant air conditioner
10. Differentiate vapour compression and vapour absorption refrigeration system

PART - B

11. A) 0.5 kg of certain gas expands adiabatically. The initial pressure and temperature are 5 bar and 185° C respectively. The final pressure is 1.15 bar and temp falls by 165° C during the expansion. If the gas does 53 KJ of work, determine the two principle specific heat capacity of the gas and constant of the gas.

(OR)

B) A gas at a pressure of 700 KN/m^2 and expands from a volume of 0.075 m^3 to 0.36 m^3 according to the law PV2.= C. Determine (i) Final temperature ii) Workdone iii) Heat transferred. Take = 1.4 and R = 0.29 KJ/Kg K.

12. A) Derive an expression for air standard efficiency of Otto cycle in terms of temperature.

(OR)

B) Brief about the engineering applications of study flow energy equation

13. A) i) Briefly explain with neat sketch 4 stroke petrol engine
ii) Explain with neat sketch simple carburetor

(OR)

B) i) Explain with neat sketch magneto coil ignition system
ii) Define cooling system and briefly explain with neat sketch water cooling system.

14. A) i) Explain with neat sketch, the analysis of exhaust gases using exhaust gas analyzer.
ii) Describe with neat sketch the method of determining HCV and LCV of a gaseous fuel using Junker's gas calorimeter

B) i) Explain how calorific value of a fuel is determining using bomb calorimeter
ii) Briefly explain the classification of fuels

15. A) i) Explain with line diagram the working of vapour compression refrigeration System.
ii) Enumerate the various loads to be encountered in A/C

(OR)

B) i) Explain with line diagram the working of vapour absorption refrigeration System.
ii) What are the factors to be considered in air conditioning for human comport?

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