TED (15) 4051 | N20-P0105 | Reg.No.....

(Revision-2015) | Signature.....

DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/MANAGEMENT/ COMMERCIAL PRACTICE, NOVEMBER-2020

APPLIED THERMODYNAMICS

[Maximum marks: 75] (Time: 2.15 Hours)

PART – A

I (Answer any ***three*** questions in one or two sentences. Each question carries 2 marks)

1. Define polytropic process
2. State first law of thermodynamics
3. Draw the P-V diagram of Diesel cycle and mark all the process
4. Write down the use of indicator diagram
5. What is black body? (3 x 2 = 6)

PART – B

II (Answer any ***four*** of the following questions. Each question carries 6 marks)

1. Define the following
   (i)closed system (ii)open system (iii) isolated system
2. For the same compression ratio, Otto cycle is more efficient than Diesel cycle, Give reason
3. Calculate the efficiency of carnot cycle if the highest temperature of the cycle is 1000^0C and lowest temperature is 80^0C
4. State six uses of compressed air.
5. Define volumetric efficiency and specific fuel consumption.
6. Explain Newton's law of cooling.
7. What is the difference between free convection and forced convection (4 x 6= 24)

PART – C

(Answer ***any of the three units*** from the following. Each full question carries 15 marks)

UNIT –I

III.(a) Derive formulae for work done, change in internal energy, P-V-T relationship and heat transfer during Isobaric process (8)

(b) When the pressure in a car tyre was checked at a temperature of 12^0C, the tyre gauge showed a reading of 1.75bars. What be the tyre gauge reading when the temperature had increased to 45^0C, assuming the volume of air in the tyre to be constant. Take the atmospheric pressure to be 1.013 bars. (7)

OR

IV. (a) Prove that the reversible adiabatic process is represented by $pv^\gamma = constant$ (8)

(b) 1 kg of air at $350kN/m^2$ and occuying $0.35m^3$ is heated at constant volume until the temperature has risen to $316°C$ Calculate (i)intial temperature of the air (ii) final pressure of the air (iii) heat added .Take $C_p = 1.005kJ/kgK$ and $C_v = 0.710kJ/kgK$

(3+2+2=7)

UNIT-II

V. (a) Show that the efficiency of an air engine working on the Diesel cycle may be expressed as $\frac{1}{\gamma} \times \frac{1}{r_k^{\gamma-1}} \times \frac{r_c^\gamma - 1}{r_c - 1}$ where r_k is the compression ratio and r_c is the cut-off ratio (8)

(b) Calculate the efficiency of a four stroke cycle gas engine, assumed to be working on constant volume cycle of stroke 45 cm, piston diameter 30 cm and a clearance volume of 11.4 litres. Assume $\gamma = 1.4$ (7)

OR

VI. (a) With the help of P-V diagram derive the expression of air standard efficiency for Carnot Cycle. (8)

(b) Compare the ideal cycle efficiencies of (a)an otto engine with compression ratio 8 (b) a diesel engine with compression ratio 13,and cut-off ratio 2.5.Assume $\gamma = 1.4$

(3 ½ + 3 ½ =7)

UNIT-III

VII.(a) Explain the procedure to draw the heat balance sheet of an I.C.engine (8)

(b) A four cylinder four stroke petrol engine is to be designed to develop an indicated power of 41 kW at a speed of 3000 r.p.m. The bore and stroke are to be identical. The indicated mean effective pressure is estimated to be 7.97 bar. Determine the bore of the engine. (7)

OR

VIII. (a) Explain Morse test (8)

(b) Explain the working of a Centrifugal compressor with a neat figure. (7)

UNIT-IV

IX. (a) Derive an expression for the quantity of heat flow through a composite wall (8)

(b) Explain the three modes of heat transfer with examples (7)

OR

X. (a) What is the function of a heat exchanger. Explain different types of heat exchangers with neat figure (8)

(b) Define absorptivity, reflectivity and transmissivity. Also state Stefan-Boltzmann law (7)

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