TED (10)–3043 Reg. No. .....

(REVISION—2010) Signature .....

FOURTH SEMESTER DIPLOMA EXAMINATION IN MECHANICAL ENGINEERING—MARCH, 2013

THERMAL ENGINEERING

[*Time* : 3 hours

(Maximum marks : 100)

Marks

PART—A
(Maximum marks : 10)

I Answer all questions in one or two sentences. Each question carries 2 marks.

1. State the Zeroth law of Thermodynamics.
2. Draw the PV diagram of an otto cycle.
3. Define specific fuel consumption.
4. Define higher calorific value.
5. Define thermal conductivity. (5×2=10)

PART—B
(Maximum marks : 30)

II Answer *any five* full questions. Each question carries 6 marks.

1. Explain system, boundary and surrounding in thermodynamics.
2. Derive the expression for air standard efficiency of carnot cycle.
3. Define : (i) Mechanical efficiency (iii) Relative efficiency
   (ii) Thermal efficiency
4. An engine produces 10 KJ as work while 80 KJ enters the engine cycle as heat. Determine the energy rejected and the thermal efficiency of the cycle.
5. Derive an expression for the flow of heat through a composite wall.
6. Illustrate the working of roots blower.
7. Compare heat and work.

(5×6=30)

PART—C
(Maximum marks : 60)

(Answer one full question from each unit. Each question carries 15 marks.)

UNIT—I

III (a) Derive the characteristic gas equation of perfect gas. 7

Marks

(b) 5 m^3 of air initially at atmospheric pressure and 20° C, is heated to 65° C in a rigid container at constant volume. Calculate :
(i) Heat required
(ii) Change in internal energy and change in enthalpy
Take Cp = 1.005 KJ/KgK and Cv = 0.718 KJ/KgK. R = 0.287 KJ/KgK. 8

OR

IV (a) Illustrate that heat transferred during a constant pressure process is equal to change in enthalpy. 7

(b) A mass of air has an initial pressure of 2MN/m^2, volume 0.1m^3 and temperature 200° C. It is expanded to its final pressure of 0.3 MN/m^2 and its volume become 0.5m^3.

Determine : (i) Mass of air (ii) Final temperature of air (take R = 0.287 KJ/KgK) 8

UNIT—II

V (a) Compare two stroke engine and four stroke engine. 7

(b) The temperature at the beginning and at the end of adiabatic compression of an otto cycle are 90°C and 450°C. Find the compression ratio and the air standard efficiency of the engine (take $\gamma = 1.4$). 8

OR

VI (a) Derive an expression for air standard efficiency of an otto cycle. 7

(b) Draw the value timing diagram of a four stroke petrol engine and mark the important points. 8

UNIT—III

VII (a) Explain the method to determine the calorific value of solid fuel with neat sketch. 7

(b) The indicated power of a two cylinder 4 stroke petrol engine is 15 KW., when it runs at a speed of 1000 rpm. If the indicated mean effective pressure is 6 bar and stroke is 1.2 times the bore, determine the necessary bore and stroke length. 8

OR

VIII (a) List out the advantages of gaseous fuel. 7

(b) A sample of fuel on analysis is found to contain carbon 80%, hydrogen 10%, oxygen 3%, sulphur 2% and the rest is incombustible matter. Find HCV and LCV. 8

UNIT—IV

IX (a) List out the use of compressed air. 7

(b) A black body at 20°C is heated to 100°C. Calculate the increase in emissive power. Stefan Boltzmann constant—5.67×10^{-8} w/m^2k^4 . 8

OR

X (a) Derive an expression for work done during adiabatic compression of an air compressor. 7

(b) The inside and outside surface of a window glass are at 25°C and 10°C respectively. If the total area of glass is 10m^2 and thickness is 4mm., determine the heat loss through the glass over a period of 2 hours. Take the thermal conductivity of glass as 0.84 w/mk. 8