TED (15) – 4051 Reg. No. .....

(REVISION — 2015) Signature .....

DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/ MANAGEMENT/COMMERCIAL PRACTICE — APRIL, 2018

APPLIED THERMODYNAMICS

[*Time* : 3 hours

(Maximum marks : 100)

PART — A
(Maximum marks : 10)

Marks

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

1. Define a closed system.
2. Define specific heat of gases.
3. List out different types of air standard cycle.
4. List any four uses of compressed air.
5. Define thermal conductivity. (5×2 = 10)

PART — B
(Maximum marks : 30)

II Answer any *five* of the following questions. Each question carries 6 marks.

1. State and explain Kelvin - Planck Statement and Clausius Statement.
2. Define the specific heat at constant volume and at constant pressure.
3. Distinguish between reversible and irreversible cycles.
4. Explain with neat sketch the working of vane blower compressor.
5. Explain Morse test.
6. Explain free convection and forced convection.
7. Explain the concept of a grey body. (5×6 = 30)

PART — C
(Maximum marks : 60)

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

UNIT — I

III (a) Define enthalpy. Show that for a constant pressure process, the heat supplied to the gas is equal to the change of enthalpy. 7

(b) A cylinder contains 180 litres of gas at a pressure of 1 bar and temperature 47°C. If this gas is compressed polytropically to 1/13th of its volume and the pressure is then 20 bar, find (i) Mass of the gas (ii) Temperature at the end of compression (iii) The index of compression (iv) The change of internal energy. Take C_v = 0.84 kJ/kgK and C_r = 1.09 kJ/kg K. 8

OR

Marks

IV (a) Derive an expression for the work done during adiabatic process. 7

(b) $0.12m^3$ of air at 1.5 MPa and 1500°C expands adiabatically to 175 kPa. Find (i) the final temperature and (ii) the work done. Take C_p = 1.0035 kJ/kgK, C_v = 0.7165kJ/kgK. 8

UNIT — II

V (a) Explain Otto cycle with P-V and T-S diagrams. 7

(b) An engine working on Carnot cycle receives heat at 700°C and rejects heat at 50°C. Find the air standard efficiency of the cycle. If it absorbs 4000kJ of heat per minute from the hot body, calculate the workdone and power of the engine. 8

OR

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

(b) In an otto cycle the temperature at the beginning and end of the isentropic compression are 290°K and 628°K respectively. Determine the air standard efficiency and the compression ratio. Take y = 1.4. 8

UNIT — III

VII (a) Define (i) Mechanical efficiency (ii) Brake thermal efficiency (iii) Relative efficiency 7

(b) The following data were recorded during testing of a four stroke cycle gas engine Area of indicator diagram = $900mm^2$, Length of indicater diagram = 70mm, Spring scale = 0.3kg/mm, Diameter of piston = 200mm, Length of stroke = 250mm, Speed 300rpm. Determine :
(i) Indicated mean effective pressure (ii) Indicated power 8

OR

VIII (a) Explain with sketch the working of a two stage reciprocating air compressor. 7

(b) Explain with neat sketch the working of axial flow compressor. 8

UNIT — IV

IX (a) Derive an expression for the flow of heat through a composite wall. 7

(b) Name the fields of application of heat transfer. 8

OR

X (a) Explain the concept of a black body. 7

(b) Heat is conducted through a compound plate composed of two parallel plates of different materials A and B of conductivities 134 W/mK and 60 W/mK and each of thickness 36 and 42 mm respectively. If the temperature of the outer face of the slab A and that of B are found to be steady at 95°C and 8°C respectively, find the temperature of the interface A/B. 8