TED (15) – 4051
(REVISION — 2015)

Reg. No. .....
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DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/ MANAGEMENT/COMMERCIAL PRACTICE — OCTOBER, 2017

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 thermodynamic system.
2. State second law of thermodynamics.
3. List different thermodynamic cycles.
4. What is brake mean effective pressure (bmep) ?
5. Define LMTD. $(5 \times 2 = 10)$

PART — B

(Maximum marks : 30)

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

1. List any six thermodynamic process.
2. What is a polytropic process ? Explain in sixty words.
3. Explain the effect of compression ratio and cut-off ratio on thermal efficiency of a cycle.
4. Draw the typical heat balance sheet of an IC engine and explain salient points.
5. List the classifications of air compressor.
6. Derive an expression for the heat transfer through a plane wall.
7. Explain free convection and forced convection in sixty words. $(5 \times 6 = 30)$

Marks

PART — C

(Maximum marks : 60)

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

UNIT — I

III (a) Derive the relation between specific heats and gas constant. 6

(b) What is the mass of 0.6 m^3 of oxygen when it is at a pressure of 7 bar and 280°C temperature ? Take gas constant as 0.26kJ/Kg/K. 9

OR

IV (a) Derive an expression for the work done during isothermal process. 6

(b) 1000 liters of air at a pressure of 800kPa is expanded to atmospheric pressure according to the law $pV^{1.25}$ = constant. Find the work done and heat transferred during the process. Take atmospheric pressure as 765 mm of Hg and adiabatic index as 1.4. 9

UNIT — II

V (a) Compare the air standard efficiencies of an Otto cycle and Diesel cycle. 6

(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 work done and power of the engine. 9

OR

VI (a) List the assumptions in thermodynamic cycles. 6

(b) Calculate the air standard efficiency of an engine working on Otto cycle, if the pressure at the beginning and end of the compression are 1 bar and 7 bar respectively. Take the index of compression as 1.41. 9

UNIT — III

VII (a) Explain with a p-v diagram, the working of multistage compressor. 6

(b) A 2 cylinder 4 stroke Cycle IC engine is to be designed to develop 15kW input power at 1200rpm. The m.e.p. of the cycle is limited to 600kPa. Determine the bore diameter and stroke of the engine, if stroke is 1.2 times bore diameter. 9

OR

VIII (a) Explain the different efficiencies of an engine. 6

(b) Describe the procedure of Morse test. 9

UNIT — IV

IX (a) Explain Stefan - Boltzman law of thermal radiation. 6

(b) Explain overall heat transfer coefficient in sixty words. 9

OR

X (a) Derive an expression for the heat transfer through a composite wall. 6

(b) Explain direct contact, regenerative and recuperator type heat exchangers. 9