TED (15) – 4051

(REVISION — 2015)

Reg. No.....

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DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/ MANAGEMENT/COMMERCIAL PRACTICE — OCTOBER, 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 state of a system.
2. What is an adiabatic process ?
3. Write the formula for air standard efficiency of Otto cycle.
4. What is mean by multi stage compression ?
5. Define thermal radiation. (5×2 = 10)

PART — B

(Maximum marks : 30)

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

1. Define first law of thermodynamics for a closed system.
2. Explain intensive and extensive properties of thermodynamic system.
3. With the help of P-V and T-S diagram explain diesel cycle.
4. Define brake power, indicated power and friction power.
5. List the advantages of multi stage compression.
6. Explain three modes of heat transfer.
7. Explain Stefan - Boltzmann law of total radiation. (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) Derive the relation between specific heats and gas constant. 7

(b) 0.0001 m^3 of air at 1000kN/m^2 expands isothermally to volume of 0.001 m^3, the initial temperature is 25°C. Assume, R = 0.297 kJ/kgK.

Find (i) the mass of the air (ii) final pressure (iii) work transferred (iv) heat transferred. 8

OR

Marks

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

(b) 2 kg of air at 10 bar and 327°C expands adiabatically to a pressure of 1 bar. Determine (i) the final volume (ii) final temperature (iii) work energy transferred during the process (iv) change in internal energy and (v) change in enthalpy. For air C_p = 1.005 kJ/kgK and R = 0.287 kJ/kgK. 8

UNIT — II

V (a) With the help of P-V and T-S diagrams explain Carnot cycle. 7

(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 103 kPa and 618 kPa respectively. Take γ = 1.4 8

OR

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

(b) In a Diesel engine, the compression ratio is 13:1 and the fuel is cut off at 8% of the stroke. Determine the air standard efficiency of the engine. Take γ = 1.4 8

UNIT — III

VII (a) Explain with neat sketch the working of a Roots blower compressor. 7

(b) A four cylinder 2 stroke engine develops 23.5 KW BP at 2500rpm. The mean effective pressure on each piston is 8.5 bar and the mechanical efficiency is 85%. Calculate the diameter and stroke of each cylinder assuming the length of stroke equal to 1.5 times the diameter of cylinder. 8

OR

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

(b) Define (i) Mechanical efficiency (ii) Indicated thermal efficiency

(iii) Specific fuel consumption (iv) Heat balance sheet 8

UNIT — IV

IX (a) Explain absorptivity, reflectivity and transmitivity. 7

(b) State and explain Fourier's law of thermal conduction. 8

OR

X (a) Explain parallel flow and counter flow heat exchangers with suitable sketch. 7

(b) The inside and outside surfaces of a window glass are at 20°C and -5°C respectively. If the glass is 1000mm × 500mm in size and 15mm thick with a thermal conductivity of 0.78 W/m°K, determine the heat loss through the glass over a period of 2 hours. 8
