A22-03500

TED (15/19) - 4024 Reg.No.....
(Revision-2015/19) Signature.....

DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/ MANAGEMENT/ COMMERCIAL PRACTICE - APRIL - 2022

THERMAL ENGINEERING

[Note:- 1. Use of steam tables and Mollier charts are permitted.
2. Missing data if any can be assumed suitably.]

[Maximum marks: 100] (Time: 3 Hours)

PART – A

(Maximum Marks: 10) Marks

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

1. Explain a thermodynamic system.
2. Define air standard efficiency
3. Define relative efficiency.
4. Explain dryness fraction.
5. List the uses of compressed air. (5 x 2 = 10)

PART – B

(Maximum Marks: 30)

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

1. State and explain first law of thermodynamics.
2. Compare petrol and diesel engine.
3. Explain a dual combustion cycle with P-V and T-S diagram.
4. Write a short note on Morse test.
5. Explain the formation of steam at constant pressure.
6. Discuss the three modes of heat transfer.
7. Explain parallel and counter flow heat exchangers. (5 x 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 an expression for work done and heat transfer of a gas undergoing constant pressure process. (8)

(b) 0.12 m^3 of air at 1500 kPa and 1500°C expand adiabatically to 175 kPa. Find final temperature and work done. Take C_p = 1.0035 kJ/kgK and C_v = 0.7165 kJ/kgK. (7)

OR

IV. (a) Derive the characteristic gas equation. (8)

(b) 0.0001 m^3 of air at 1000kN/m^2 expands isothermally to a volume of 0.001m^3, the initial temperature is 25°C. Taking R = 0.297 kJ/kgK. Find the mass of air, the Final pressure and work transferred. (7)

UNIT-II

V. (a) Derive the air standard efficiency of an Otto cycle. (8)

(b) Explain the valve timing diagram of a four stroke diesel engine. (7)

OR

VI. (a) Explain the working of a four stroke petrol engine. (8)

(b) Find the air standard efficiency of a diesel engine working on diesel cycle having a compression ratio of 14 and the cut-off taken place at 6% of stroke. (7)

UNIT-III

VII. (a) Explain the working of a single cylinder double acting steam engine. (8)

(b) Calculate the enthalpy of 1 Kg of steam at a pressure of 8 bar and dryness fraction of 0.8. How much heat would be required to raise 2 kg of this steam from water at 20°C. (7)

OR

VIII. (a) Derive an expression for the velocity of steam leaving a nozzle. (8)

(b) Dry saturated steam at a pressure of 15 bar enters in a nozzle and is discharged at a pressure of 1.5 bar. Find the final velocity of the steam, when the initial velocity of the steam is negligible. If 10% of the heat drop is lost in friction. Find the percentage reduction in the final velocity. (7)

UNIT-IV

IX. (a) Explain Fourier law of thermal conduction and Newton Rikhman equation of thermal convection. (8)

(b) Derive an expression for the heat transfer through a composite wall. (7)

OR

X. (a) Explain the working of single stage reciprocating air compressor. (8)

(b) Find the minimum energy required to compress one kg of air from 15°C and 1 bar to 40 bar in 2 stage compressor. The law of compression is $pV^{1.25}$=constant and intercooling is perfect. (7)
