



TED (15) – 4024

(REVISION — 2015)

Reg. No. ....

Signature .....

DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/  
MANAGEMENT/COMMERCIAL PRACTICE — OCTOBER, 2019

**THERMAL ENGINEERING**

[Time : 3 hours

(Maximum marks : 100)

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

**PART — A**

(Maximum marks : 10)

Marks

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

1. Explain the term 'Internal Energy'.
2. State any two assumptions made in the air standard cycle.
3. Define indicated power of an IC engine.
4. List the types of air compressor.
5. Define the specific heat of gas at constant pressure.

(5 × 2 = 10)

**PART — B**

(Maximum marks : 30)

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

1. Distinguish between open system and closed system.
2. Explain Diesel cycle with PV diagram.
3. Distinguish wet steam, dry steam and superheated steam.
4. Describe Fourier's Law of Heat conduction with necessary equation.
5. Explain the concept of gray body and black body.
6. Explain Morse test.
7. Explain the working of 4 stroke petrol engine.

(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 characteristic equation of perfect gas. 8  
 (b) Explain zeroth law and first law of thermodynamics. 7

OR

- IV (a) Derive expressions for work and heat transfer in isothermal process. 8  
 (b) Describe the following (i) Boyle's law (ii) Charle's law (iii) Regnault's law 7

## UNIT — II

- V (a) Explain Carnot heat engine cycle. 8  
 (b) An engine working on Otto cycle has a volume of  $0.45 \text{ m}^3$ , pressure 1 bar and temperature  $30^\circ\text{C}$  at the beginning of compression stroke. At the end of compression stroke, the pressure is 11 bar. 210 kJ of heat is added at constant volume. Determine :  
 (i) Temperatures and volume after compression  
 (ii) Efficiency 7

OR

- VI (a) Derive expression of air standard efficiency of Otto cycle. 8  
 (b) A Carnot engine working between  $400^\circ\text{C}$  and  $40^\circ\text{C}$  produces 130 kJ of work. Determine :  
 (i) The engine thermal efficiency  
 (ii) The heat added  
 (iii) The entropy changes during heat rejection process. 7

## UNIT — III

- VII (a) Explain how the indicator diagram is obtained for IC engine. 8  
 (b) A single cylinder, 4 stroke cycle engine was tested and following results were obtained.
- |                                  |   |                          |
|----------------------------------|---|--------------------------|
| Mean height of indicator diagram | — | 21mm                     |
| Indicator spring number          | — | 27 kN/m <sup>2</sup> /mm |
| Swept volume of cylinder         | — | 14 litres                |
| Speed of engine                  | — | 396 rpm                  |
| Brake load                       | — | 77 kg.                   |
| Brake drum radius                | — | 700 mm                   |

Determine : (i) Indicated power (ii) Brake power (iii) Mechanical efficiency 7

OR

- VIII (a) Explain formation of steam with the help of T - H diagram. 8
- (b) 4 Kg of 0.5 dryness fraction steam at 6 bar pressure is heated so that it becomes :
- Case I : 0.95 dry at 6 bar pressure.
- Case II : Dry and saturated at 6 bar pressure
- Determine in each case the quantity of heat required to be supplied. 7

## UNIT — IV

- IX (a) Explain the classification of heat exchanger based on direction of flow. 6
- (b) List the uses of compressed air. 4
- (c) Explain Stefan - Boltzman's law of thermal radiation. 5

OR

- X (a) A brick wall 250 mm thick is faced with concrete 50 mm thick. If the temperature of the exposed brick face is 30°C and that of concrete is 5°C, determine the heat lost per hour, through a wall 10m long and 5m high. Also determine the interface temperature (Given  $K_{\text{brick}} = 0.69 \text{ W/m}^\circ\text{K}$ ,  $K_{\text{concrete}} = 0.93 \text{ W/m}^\circ\text{K}$ ). 8
- (b) A single acting air compressor has a cylinder of 200 mm diameter and 300 mm stroke and runs at 150 rpm. Suction pressure and temperature are 1 bar absolute and 15°C respectively. Delivery pressure is 10 bar absolute. Calculate work done per cycle and power required to drive the compressor. Assume the law of compression to be  $PV^{1.2} = \text{constant}$ . Neglect clearance volume. 7