TED (15) – 4024

(REVISION — 2015)

Reg. No. .....

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# DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/ MANAGEMENT/COMMERCIAL PRACTICE — OCTOBER, 2017

## THERMAL ENGINEERING

[*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. State Boyle's Law.
2. Define Airstandard cycle.
3. Draw P - V diagram of Dual Combustion cycle.
4. Define Brake Power.
5. State the expression for volumetric efficiency of compressor in terms of clearance volume and stroke volume. $(5 \times 2 = 10)$

### PART — B

(Maximum marks : 30)

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

1. Explain the terms temperature and enthalpy and their S.I. units.
2. Derive the characteristic gas equation.
3. Illustrate Carnot cycle with P-V and T-S diagrams.
4. Define Indicated Power, Frictional Power and Brake Thermal efficiency of I C engines.
5. A petrol engine develops 7.5 kw IP. Fuel consumption is 2 kg/hr and calorific value of fuel is 42000 kj/kg. If it's compression ratio is 6, calculate relative efficiency of the engine.
6. Explain the concept of Black body and Grey Body.
7. State the uses of compressed air. $(5 \times 6 = 30)$

Marks

## PART — C

(Maximum marks : 60)

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

### UNIT — I

III (a) Classify Thermodynamic system and explain different types with one example for each. 7

(b) Derive expression for work done during isothermal expansion process. 8

OR

IV (a) Explain Regnault's law, Joule's Law and Avogadro's Law. 7

(b) Some amount of gas is compressed according to the law $PV^{1.37} = C$. Before compression, the pressure and temperature are 1 bar and 316 k respectively. The compression ratio is 13.5.

Find (i) Pressure at the end of compression.

(ii) Temperature at the end of compression.

(iii) Work done/kg during compression.

Take R = 289 J/Kgk. 8

### UNIT — II

V (a) Illustrate Otto Cycle with P - V and T - S diagrams. 7

(b) A Carnot cycle works with isentropic compression ratio 5 and the maximum temperature is limited to 550K. Compute the minimum temperature in the cycle and air standard efficiency of the cycle.

Take ratio of specific heats as 1.4. 8

OR

VI Derive expression for air standard efficiency of Diesel cycle in terms of compression ratio and cut-off ratio. 15

### UNIT — III

VII (a) A rope brake dynamometer fitted on an engine has wheel diameter 600mm and rope diameter 5mm. The dead load on the wheel is 210N and spring balance reads 30N. If the engine makes 450 rpm, find the brake power developed by the engine. 7

(b) Explain the formation of steam at constant pressure with a graph indicating the effect of pressure and temperature. 8

OR



Marks

VIII (a) Determine the quantity of heat required to produce 1kg of wet steam with dryness fraction 0.9 at a pressure of 6 bar from water at 25° C. 7

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

### UNIT — IV

IX (a) Explain free convection and forced convection. 7

(b) A single acting single cylinder air compressor is required to compress 1 kg of air from 100 KPa to 400 KPa isothermally. The initial temperature of air is 27°C. Calculate the power required to drive the compressor, if speed of compressor is 100 rpm.. Take characteristic gas constant for air as 0.287 KJ/Kgk. 8

OR

X (a) Heat is conducted through a composite plate composed of two parallel plates of different materials A and B of thermal conductivities 134 w/m-k and 60 w/m-k and thickness 36mm and 42mm respectively. The temperature of outer surface of slab A and that of B are 96°C and 8°C respectively. Find the rate of heat transfer and inter face temperature, if the cross sectional area of plate across direction of heat flow is 10 $m^2$. 7

(b) Explain the working of axial flow compressor with suitable figure. 8

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