TED (15) – 4051

(REVISION — 2015)

Reg. No.....

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

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 adiabatic process.
2. Draw the P-V Diagram of a Diesel Cycle and mention all the process.
3. Define specific fuel consumption.
4. State Stefan-Boltzmann Law of total radiation.
5. What is black body ? (5×2 = 10)

PART — B

(Maximum marks : 30)

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

1. Derive the relation between specific heats and Gas constant.
2. Derive the equation for work done by the gas for an adiabatic process.
3. With the help of a P-V diagram explain cut-off ratio and expansion ratio of a Diesel Cycle. Also mention the relation between Cut-off ratio, Expansion ratio and Compression ratio.
4. Define Break power, Friction power and Indicated power of an engine.
5. What is Indicated thermal efficiency and break thermal efficiency ? Also state the equations for finding out the Indicated thermal efficiency and break thermal efficiency.
6. Define absorptivity, reflectivity and transmissivity.
7. State and explain Fourier's law of heat conduction. (5×6 = 30)

PART — C

Marks

(Maximum marks : 60)

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

UNIT — I

III (a) Derive the formulae for work done and heat transfer for a Polytropic process. 8

(b) What is an adiabatic index ? Why it is always greater than unity ? 7

OR

IV (a) The values of specific heats at constant pressure and constant volume for an ideal gas are 0.984 and 0.728KJ/KgK. Find the values of characteristic gas constant (R) and ratio of specific heats (γ) of the gas. If 1kg of gas is heated at constant pressure from 25°C to 200°C, Estimate the heat added, ideal work done, and change in internal energy. Also find the pressure and final volume, if the initial volume as $2m^3$. 8

(b) What are intensive properties and extensive properties ? Give examples. 7

UNIT — II

V (a) Explain briefly Otto cycle with the help of P-V diagram and derive an expression for the ideal efficiency of Otto cycle. 8

(b) A Diesel engine has a compression ratio of 14 and cut-off takes place at 6% of the stroke. Find the air standard efficiency. 7

OR

VI (a) Explain briefly the Diesel cycle with the help of P-V diagram and derive an expression for the ideal efficiency of Diesel cycle. 8

(b) An engine working on Otto cycle has the following condition. The pressure at the beginning of compression is 1 bar and at the end of compression is 11 bar. Calculate the compression ratio and air standard efficiency of engine. Assume $\gamma = 1.4$. 7

UNIT — III

VII (a) Explain the method used for determining the indicated power of a multi cylinder engine without using an indicator. 8

(b) Explain the working of a centrifugal compressor with a neat figure. 7

OR

VIII (a) What is heat balance sheet ? Explain the various parameters required to complete the heat balance sheet with necessary equations. 8

(b) How to calculate the Mean effective pressure using indicator diagram. 7

UNIT — IV

IX (a) Derive an expression for the quantity of heat flow through a composite wall. 8

(b) Explain Conduction, Convection and Radiation with examples. 7

OR

X (a) Explain different types of Heat exchangers. 8

(b) The walls of a room consists of parallel layers in contact of cement, brick and wood of thickness 20mm, 300mrn and 10 mm respectively. Find the quantity of heat that passes through each square meter of wall per minute, if the temperature of air in contact with walls is 5°C and 30°C inside. The thermal conductivity (k) for cement, brick and wood are 0.294, 0.252 and 0.168 W/mK respectively. 7