TED (10) – 3043 Reg. No. .....

(REVISION — 2010) Signature .....

DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/ MANAGEMENT/COMMERCIAL PRACTICE — APRIL, 2018

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. Define Thermal Engineering.
2. What is Isentropic Process ?
3. State Stefan Boltzmann Equation.
4. State requirement of good fuel.
5. What are the uses of compressed air ? (5×2 = 10)

PART — B

(Maximum marks : 30)

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

1. Derive an expression for the work done during an isothermal process.
2. 1 kg of ideal gas is heated from 18.3°C to 93.4°C. Assuming R = 0.264 kj/kg°k and $\gamma = 1.18$ for the gas, find (a) Specific heat (b) Change in internal energy and (c) Change in enthalpy.
3. Draw the P-V and T-S diagram of Diesel cycle and explain the each processes.
4. Define calorific value of fuel and name the different constituents of fuel.
5. How IC engine are classified ?
6. Explain the following with the aid of a sketch :
   (a) Parallel flow heat exchanger (b) Counter flow heat exchanger.
7. Explain the working of single acting single stage compressor with neat sketch.

(5×6 = 30)

Marks

PART — C

(Maximum marks : 60)

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

UNIT — I

III (a) Deduce a formula for the work transfer during adiabatic process. 8

(b) 2.5 kg of air having pressure of 8 bar and volume of $0.4m^3$ expand isothermally to a volume of $1m^3$. Determine :

(i) Initial temperature of air

(ii) Final temperature of air

(iii) External work done

(iv) Heat transfer, for air takes Cp = lkj/kg°k 7

OR

IV (a) Explain specific heat of gas at constant pressure and constant volume. 8

(b) A quantity of air has a volume of $0.4m^3$ at a pressure of 5 bar and a temperature of 80°c. It is expanded in a cylinder at a constant temperature to a pressure of 1 bar. Determine the amount of work done by the air during expansion. 7

UNIT — II

V (a) Sketch and explain the valve timing diagram for two stroke petrol engine. 8

(b) An engine working on the otto cycle has a cylinder diameter of 150mm and a stroke of 225mm. The clearance volume is $1.25*10^{-3}$ m^3. Find the air standard efficiency of this engine. Take $\gamma = 1.4$. 7

OR

VI (a) Explain briefly the dual combustion cycle, using P-V and T-S diagram. 8

(b) An engine working on Carnot cycle receives heat at 700°c and rejects heat at 50°c. Find the air standard efficiency of the cycle. If it absorbs 4000Kj of heat per minute from the hot body, calculate the work done and power of the engine. 7

Marks

UNIT — III

VII (a) The following results were obtained during a test on two cylinder four stroke cycle Petrol engine over a period of one hour.

Cylinder diameter	-	108mm
Piston stroke	-	135mm
Speed	-	16.5rev/sec.
Brake torque	-	90N-m
Fuel consumption	-	2.5kg.
Calorific value	-	45500Kj/kg.

Calculate - BP, Brake thermal efficiency and indicated power, if Mechanical efficiency is 82%. 8

(b) List out the merits and demerits of liquid fuels over solid fuels. 7

OR

VIII (a) Define the following :

(i) Brake power. (ii) Indicated power

(iii) Total fuel consumption (iv) Specific fuel consumption

(v) Mechanical efficiency (vi) Brake thermal efficiency. 8

(b) A sample of coal has the following composition by mass Carbon 75%, Hydrogen 6%, Oxygen 8%, Nitrogen 2.5%, Sulpher 1.5 % and Ash 7%. Calculate its higher and Lower Calorific values per kg of coal. 7

UNIT — IV

IX (a) The walls of a room consists of parallel layers in contact of cement, brick and wood of thickness 20mm, 300mm and 10mm respectively. Find the quantity of heat that passes through each m^2 of wall per minute. If temperature of air in contact with the Wall is 5°c and 30°c inside. The values of K for cement, brick and wood are 0.294, 0.252 and 0.168 W/m°k respectively. 8

(b) How to classify air compressors. 7

OR

X (a) Define absorbivity, reflectivity and transmissivity. 8

(b) Explain with simple sketch the working of multistage air compressor. 7