

MAHARASHTRA ANIMAL AND FISHERY SCIENCES UNIVERSITY, NAGPUR
SEMESTER END THEORY EXAMINATION, B.Tech. (D.T.)

Semester	: II (V Dean)	Academic Year	: 2023-2024
Course No.	: DE- 204	Course Title	: Thermodynamics
Credits	: 1+1=2	Total Marks	: 50
Day & Date	: Thursday; 08/08/2024	Time	: 2 hrs

- Note :**
- 1) All questions from **Section 'A'** are compulsory.
 - 2) Solve **Any Three** questions from **Section 'B'**.
 - 3) Draw neat and well labelled diagram wherever necessary.

SECTION –‘A’

Q. 1 A) Choose the most appropriate answer from the options given below. (05)

- i) The compression ignition system is used in
 - a) Diesel engine
 - b) Petrol engine
 - c) Gas engine
 - d) All of these
- ii) The heat liberated by combustion of a fuel is known as
 - a) Calorific value
 - b) Ignition quality
 - c) Volatility
 - d) knocking
- iii) The specific gas constant is equal to
 - a) Ratio of two specific heats
 - b) Difference of two specific heats
 - c) Product of two specific
 - d) Sum of two specific heats
- iv) Joule's law states that
 - a) Change of internal energy is proportional to change of temperature
 - b) Change of pressure is proportional to change of temperature
 - c) Change of volume is proportional to change of temperature
 - d) None of these
- v) Gas laws are applicable to
 - a) Gases alone and not to vapours
 - b) Gases as well as vapours
 - c) Gases and steam
 - d) All of these

B) Define the following. (05)

- i) Entropy
- ii) Zeroth law of Thermodynamics
- iii) IC engine
- iv) Enthalpy
- v) Isolated System

Q. 2 A) Give reasons for the following. (05)

- i) Cooling of air in dessert cooler is an adiabatic process.
- ii) Volume is an extensive property.
- iii) It is an impossible to transfer heat from a body at lower temperature to a body at higher temperature without the aid of an external source.
- iv) Frictionless heat engine cannot be 100% efficient practically.
- v) Mixing of air with fuel is required in engine.

(P.T.O.)

- B) State whether True or False. If false, rewrite the statement after making necessary corrections. (05)
- i) The value of the universal gas constant is 8.314 J/mole/k.
 - ii) Speed of petrol engine is regulated by throttling the air going the engine with the help of throttle valve.
 - iii) The absolute zero temperature is taken as 273°C.
 - iv) The efficiency of the Carnot cycle may be increased by increasing the highest temperature.
 - v) Isochoric is a constant entropy process.

SECTION –‘B’

- Q. 3 A) Explain the first law of the thermodynamics as referred to closed systems undergoing a cyclic change. (05)
- B) Describe the working Carnot cycle. (05)
- Q. 4 A) Write a short note on Otto cycle. (05)
- B) In an air Compressor (reciprocating type), air is alternatively sucked & compressed by reciprocating piston in the cylinder. After one suction stroke, air is at a state 10^5 Pa of pressure, 27°C of temperature and 0.86 m³/kg of specific volume. If it is compressed to a final pressure of 6×10^5 pa and compression process is assumed as isothermal. Determine: (i) Work done; (ii) change in internal energy; (iii) Heat transferred. (05)
- Q. 5 A) Why C_p is greater than C_v ? (03)
- B) State and discuss the Seond Law of thermodynamics. (03)
- C) Classify the various thermodynamic processes and with P-V representation derive enthalpy P-V-T relation for isobaric process. (04)
- Q. 6 A) A petrol sample was found to have 86% carbon and 14 % hydrogen by mass. When used in an engine the air supply is 90% of that theoretically required for complete combustion. Assuming that all the hydrogen is burnt and that the carbon burns to carbon monoxide and carbon dioxide so that there is no free carbon left, calculate the percentage analysis of dry exhaust gases by volume. (03)
- B) Air at 15°C and 1.05 bar occupies 0.02 m³. The air heated at constant volume until the pressure is 4.2 bar, and then cooled at constant pressure back to its original temperature. Calculate the net heat flow to or from the air and net entropy change. (03)
- C) Explain the working of Petrol engine with the help of sketch. (04)
- Q. 7 Explain the working of two stroke and four stroke internal combustion engine with neat diagrams. Also, discuss the factors affecting their performance. (10)
