Seat No. ……..…… **Enrollment No. ……**

PARUL UNIVERSITY
FACULTY OF AGRICULTURE
B.Tech (FoA) Winter 2019-20 Examination

Semester : 2 **Date : 19/12/2019**
Subject Code : 20104158 **Time : 10.30 am to 12.30 pm**
Subject Name : Thermodynamics and Heat Engine **Total Marks : 50**

Instructions:
1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start answer of new question on new page.
5. Use properties table/chart, if necessary.

Q.1 A) Fill in the blanks (Each of 0.5 Mark) **(05)**

(1) The field of science, which deals with study of the interconversion of heat and work and the energy associated with it is called as …..

(2) The space or matter within a prescribed boundary upon which attention is focused for study is called as a ……

(3) …… law of thermodynamics explains the thermal equilibrium.

(4) The process which occurs at a constant temperature is called as …… process.

(5) According to the Boyle's law the pressure and volume of a gas at constant temperature are ……proportional.

(6) The total heat content of the system in called as its …..

(7) The SI unit of absolute temperature is…….

(8) A ….. system does not exchange mass with the with the surrounding but exchanges the energy.

(9) The connecting rod in an IC engine connects the ….. to the crank shaft.

(10) In ideal gas equation PV=nRT, the unit of temperature is…..

(11) The chimney of a boiler uses ……. Draught.

Q.1 B) Choose the correct answer from the alternatives given (Each of 0.5 Mark) **(10)**

i) Carnot cycle consists of four ……. processes.
a) thermal b) adiabatic c) reversible d) all of these

ii) Which of the following is not an intensive property?
a) weight b) pressure c) specific heat d) density

iii) …… provides the power during non-power strokes in IC engines.
a) Governor b) Piston c) Flywheel d) Crankshaft

iv) Which of the following is not a type of the mechanical draught?
a) forced b) induced c) dual d) balanced

v) The …… cycle is also called as constant volume cycle because the heat addition occurs at constant volume.
a) Otto b) Diesel c) Carnot d) Dual

vi) Heat and work are the examples of transit energy whereas the internal energy is a…
a) chemical energy b) pure energy c) stored energy d) transit energy

vii) ….. cycle is the combination of Otto cycle and Diesel cycle.
a) Carnot b) Kelvin c) Dual d) none of these

viii) Boiling point of water at atmospheric pressure is …….
a) 100°C b) 121.1°C c) 72°C d) 100.15°C

xi) In diesel engine the high compression ratio ignites the charge without need of ……..
a) compression b) spark plug c) friction d) all of these

x) The dryness fraction of steam ranges between.
a) -1 to 0 b) >0 to 1 c) 0.5 to 1 d) 1 to 2

xi) In dual combustion cycle, the heat absorption takes place at constant …..
a) pressure b) volume c) temperature d) both a and b

xii) Petrol engine is an example of ……. combustion engine.
a) internal b) external c) intermediate d) both a and b

xiii) Petrol engine is not a ……. ignition engine.
a) spark b) compression c) dual d) none of these

xiv) A diesel engine is also called as *'Compression Ignition Engine'* because ignition of charge (fuel-air mixture) occurs due to high temperature developed by …..
a) compression b) spark plug c) friction d) all of these

xv) The distance moved by piston along the cylinder axis from one end to another end i.e. BDC to TDC is called ……
a) combustion b) bore c) connecting d) stroke

xvi) The ratio of total volume to clearance volume is equal to …… in IC engine.
a) compression ratio b) scavenging ratio c) swept volume d) clearance ratio

xvii) The ratio of brake power to the indicated power of an IC Engine is called as the ….. efficiency of the engine.
a) mechanical b) power c) thermal d) engine

xviii) The heat of combustion of a fuel calculated by excluding the heat of condensation of vapours formed during the combustion is known as …….calorific value.
a) lower b) net c) higher d) both a and b

xix) The calorific value of a solid fuel is expressed as …….
a) kJ/kg°C b) Watt c) Cal/h d) kJ/kg

xx) The temperature of superheated steam is ……. than the saturation temperature at corresponding pressure.
a) lower than b) equal to c) higher than d) independent of

Q.2 A) Define the following (Any five) **(05)**

1) Thermodynamics
2) Isobaric Process
3) Zeroth law of Thermodynamics
4) Enthalpy
5) Entropy
6) Artificial draught
7) Specific heat

Q.2 B) Answer the following (Any five) **(05)**

1) Why the change in internal energy is always zero in an isothermal process?
2) Represent the Otto cycle on P-V diagram and state the equation for the efficiency of Otto cycle.
3) Represent the isothermal process on P-V diagram and state the expression for work done in isothermal process.
4) Why the efficiency of dual cycle is more than that of the Otto cycle?
5) Define a adiabatic system.
6) State the function of piston ring in IC engine.
7) Enlist any five boiler mountings.

Q.3 Write short notes on the following (Any five) **(10)**

1) Otto engine
2) Carnot efficiency
3) Boiler
4) Calorific value
5) Indian Boiler Act
6) Polytropic index
7) Ideal gas equation

Q.4 Answer the following in detail (Any three) **(15)**

1) Describe the steam formation process with proper representation on *Temperature-Enthalpy* diagram.
2) Describe the working of 4-stroke IC engine and the function of each stroke.
3) What is the significance of this course ‘thermodynamics’ for a dairy technocrat?
4) Enlist different thermodynamic processes and explain any one in detail along with its PVT relationship and enthalpy change during the process.
5) Explain the working of boiler in brief.