

Seat No: _____

Enrollment No: _____

PARUL UNIVERSITY
FACULTY OF AGRICULTURE
B.Tech. Dairy Technology, Summer 2018 - 19 Examination

Semester: 2

Subject Code: 20104158

Subject Name: Thermodynamics and Heat Engine

Date: 15/04/2019

Time: 02:00pm to 04:00pm

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 new question on new page.

Q.1

A) Fill in the blanks (Each of 0.5 Mark)

(05)

- i) Cochran boiler is _____.(Fire tube boiler or water tube boiler)
- ii) Dryness fraction for dry saturated steam is _____.
- iii) Petrol engine is also called as _____engine.(SI or CI)
- iv) Any process or series of processes whose end states are identical is called a _____.
- v) Charles law states that , when pressure is constant, volume of a given mass of perfect gas is _____ proportional to temperature.(Directly or inversely)
- vi) Energy is an _____ property.(Intensive or extensive)
- vii) System and surrounding together constitute _____.
- viii) Lancashire boiler is _____.(Horizontal boiler or Vertical boiler)
- ix) The function of feed check valve is _____.
- x) Heat is _____ function.

B) Multiple Choice Questions (Each of 0.5 Mark)

(10)

- i) Which stroke is designated by the piston moving from BDC to TDC with both the intake and exhaust valves in the closed position?
(a) Suction stroke (b) Compression stroke (c) Power stroke (d) Exhaust stroke
- ii) In a Carnot engine if $T_1=600$ K and $T_2=340$ K then efficiency of the Carnot engine will be
a) 55.65 % b) 43.33 % c) 65.12% d) 55.32%
- iii) A carburetor is used to supply.....
(a) Petrol only (b) Air and diesel
(c) Diesel only (d) Petrol and air
- iv) During adiabatic process, there is no
a) Heat transfer b) Work transfer
c) Enthalpy change d) None of the above
- v) In Carnot cycle consist of,
(a) Two reversible isothermal & two reversible adiabatic processes.
(b) Two reversible isothermal & two reversible isobaric processes.
(c) Two reversible isochoric & two isothermal processes.
(d) none of the above

- vi) Which of the following is an intensive property of a thermodynamic system?
 a) Volume (b) Mass (c) Temperature (d) Energy
- vii) System in which mass and energy both can cross boundary of the system is known as _____ system.
 a) Close system (b) Open system (c) Isolated system (d) none of the above
- viii) Unit of mechanical power is
 a) Joule (b) Watt (c) Pascal (d) Newton
- ix) Diesel cycle consists of
 a) Two reversible adiabatic & two reversible isochoric processes.
 b) Two reversible adiabatic & two reversible isobaric processes.
 c) One reversible isochoric, One reversible isobaric, & two reversible adiabatic processes.
 d) none of the above
- x) Universal gas constant is
 a) Change with temperature (b) Different for different perfect gases
 c) change with pressure (d) remains constant
- xi) In a two stroke cycle engine, one cycle is completed in the following number of revolutions of crank shaft
 a) 2 (b) 3 (c) 1 (d) 4
- xii) Sensible heat is _____
 a) Does not allow rise in temperature
 b) Result in temperature rise
 c) Result in change in the phase of the substance
 d) Is absorbed by a liquid at saturation temperature
- xiii) During addition of latent heat, there is change in
 a) Temperature (b) Temperature and phase
 c) Phase only (d) all of the above
- xiv) Efficiency of diesel cycle depends upon
 a) Compression ratio (b) Cutoff ratio (c) index γ (d) all of the above
- xv) Compressors are used to increase the pressure of
 a) Air (b) Gas (c) Vapour (d) All of the above
- xvi) A type of boiler in which water and steam flow takes place by means of pump is called
 a) Fired tube boiler (b) Water tube boiler
 c) Natural circulation boiler (d) Forced circulation boiler
- xvii) Which of the following is not boiler mounting?
 a) Water level indicator (b) Feed pump
 c) Fusible plug (d) Pressure gauge
- xviii) A mounting which is used to protect boiler against damage due to overheating caused by low water level is
 a) Fusible plug (b) Dead weight safety valve
 c) Lever safety valve (d) Blow off cock
- xix) The function of economiser is _____
 a) To heat flue gases (b) To heat air going to boiler furnace
 c) To heat fuel going to the boiler (d) To heat the feed water
- xx) The function of Air preheater is _____
 a) To heat flue gases (b) To heat air going to boiler furnace
 c) To heat fuel going to the boiler (d) To heat the feed water

Q.2**A) Define the following (Any five out of seven questions) (05)**

- (1) Define: Zeroth law of thermodynamics
- (2) Define: Isolated system
- (3) Define: Thermodynamic equilibrium
- (4) Define: Enthalpy
- (5) Define: Reversible process
- (6) Define: Thermal Energy reservoir
- (7) Define: Boiler

B) Answer the following (Any five out of seven questions) (05)

- (1) Write Formula for the COP of Heat pump.
- (2) Write name of any two accessories.
- (3) What is first law of thermodynamics for system undergoing change of state?
- (4) What is dryness fraction?
- (5) Write equation of state.
- (6) What is entropy?
- (7) What is available energy (Exergy)?

Q.3 Write Short notes (Any five out of six questions) (10)

- (1) Write Kelvin planck statement and clausius statement of second law.
- (2) Write classification of compressor.
- (3) What is boiler mounting? Write name of various boiler mountings.
- (4) Write difference between two stroke and four stroke engine.
- (5) A mixture of gas expands from 0.03m^3 to 0.06m^3 at a constant pressure of 1 MPa and absorbs 84 k J of heat during the process. Find change in internal energy of the mixture.
- (6) A heat engine receives heat at the rate of 1500 kJ/min and gives an output of 8.2 kw. Determine :
 - i) Thermal efficiency
 - ii) Rate of heat rejection.

Q.4 Long Questions (Any three out of four questions) (15)

- (1) Explain Otto cycle with p-v and T-s diagram and derive the equation of Efficiency.
- (2) Explain construction and working of Babcock wilcox boiler with neat sketch.
- (3) Explain construction and working of four stroke diesel engine with neat sketch.
- (4) Derive the steady flow energy equation (SFEE).