Registration No: | | | | | | | | | | |

Total Number of Pages: 02 **B.TECH**

15BE2103

1st Semester Back Examination 2016-17
THERMODYNAMICS
BRANCH(S): ALL
Time: 3 Hours
Max Marks: 100
Q.CODE: Y620

Answer Part-A which is compulsory and any four from Part-B.
The figures in the right hand margin indicate marks.

Part – A (Answer all the questions)

Q1 **Answer the following questions:** **(2 x 10)**

a) In ---------- engines, only air is inducted by suction into the cylinder.
b) ---------- is a device which operating in a cycle, maintains a body at a temperature lower than the temperature of the surrounding.
c) A wall which permits the flow of heat is a ---------- wall.
d) ---------- is a device used to measure area of indicator diagram
e) Infinite slowness is the characteristics feature of a ---------- process
f) ---------- is a device which increases the velocity or KE of a fluid at the expense of its pressure drop.
g) The thermal energy reservoir from which heat is transferred to the system operating in a heat engine cycle is called the----------
h) ---------- is high grade energy
i) The entropy of an ---------- system can never decrease.
j) A---------- is a state from which a change of phase may occur without a change of pressure or temperature.

Q2 **Answer the following questions: *Short answer type*** **(2 x 10)**

a) What are the four basic components of a steam power plant?
b) What is quasi static process? What is its characteristic feature?
c) What are adiabatics and diathermal walls?
d) Sate first law of thermodynamics.
e) Give kelvin planck's statement of 2nd law
f) Define COP of refrigerator
g) What is quality of steam?
h) What is throttling device? Where it is used?
i) What is the mean effective pressure?
j) Define thermometric property

Part – B (Answer any four questions)

Q3 **a)** What is pure substance? Draw phase equilibrium diagram for pure substance on p-T and h-s coordinates? **(10)**

b) Steam initially at 0.3 Mpa,250 ^{0}c is cooled at constant volume. (a) At what temperature will the steam becomes saturated vapour? (b) What is the quality at 80^{0}c?. What is the heat transferred per kg of steam in cooling from 250^{0}c to 80^{0}c? **(5)**

Q4 **a)** What is a heat pump? How does it differ from refrigerator? With neat sketch explain the working of refrigerator. **(10)**

b) A turbine is supplied with steam at a gauge pressure of 1.4 MPa. After expansion in the turbine the steam flows into a condenser which is maintained at a vacuum of 710 mm Hg. The barometric pressure is 772 mmHg.Express the inlet and exhaust steam pressures in pascals(absolute). Take the density of mercury as $13.6 \times 10^3 kg/m^3$ **(5)**

Q5 **a)** What is steady flow process? Derive steady flow equation **(10)**

b) Air at a temperature of 15^0c passes through a heat exchanger at a velocity of 30 m/s where its temperature is raised to 800^0c. It then enters a turbine with the same velocity of 30m/s and expands until the temperature falls to 650^0c. On leaving the turbine, the air is taken at a velocity of 60 m/s to a nozzle where it expands until the temperature has fallen to $500\ ^0c$. If the air flow rate is 2kg/s. calculate (a) the rate of heat transfer to the air in the heat exchanger (b) the power output from the turbine assuming no heat loss, (c) the velocity at exit from the nozzle assuming no heat loss. Take c_p=1.005 kJ/kgk enthalpy of air $h=c_pt$ **(5)**

Q6 **a)** Show that efficiency of a reversible engine operating between two given constant temperature is maximum. **(10)**

b) Three identical finite bodies of constant heat capacity are at temperatures 300K,300K, 100K. If no work or heat is supplied from outside what is the highest temperature to which any one of the bodies can be raised by the operation of heat engines or refrigerators? **(5)**

Q7 **a)** What do you understand by path function and point function? S how that work is path function and not property. **(10)**

b) Distinguish between the terms change of states, path and process. What is a thermodynamic cycle? **(5)**

Q8 **a)** Show that energy is property of system. What is PMM1? why is it impossible. **(10)**

b) A piston and cylinder machine contains a fluid system which passes through a complete cycle of four processes. During a cycle, the sum of all heat transfers is -170 kJ. The system completes 100 cycles per min.Complete the following table showing the method for each item and compute the net rate of work output in kW **(5)**

Process	Q(kJ/min)	W(Kj/min)	ΔE(kJ/min)
a-b	0	2170	---
b-c	21,000	0	---
c-d	-2,100	---	- 36,600
d-a			

Q9 **a)** Establish the equivalence of kelvin planck's statement and clausius statement **(10)**

b) Write a short note on internal combustion engines. **(5)**