GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–I &II (NEW) EXAMINATION – SUMMER-2019

Subject Code: 3110006   **Date: 04/06/2019**

Subject Name: Basic Mechanical Engineering
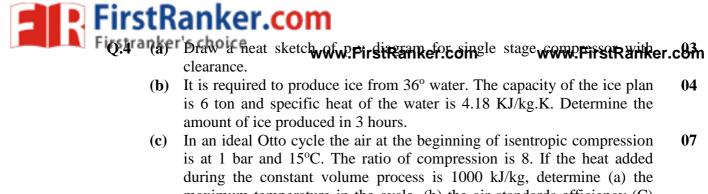
Time: 10:30 AM TO 01:00 PM   **Total Marks: 70**

Instructions:
1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Use of steam table is permitted.

			Marks
Q.1	**(a)**	Define Melting point, Boiling point and Tripple point of water using p-v diagram.	**03**
	(b)	Derive an expression for internal energy for a closed system.	**04**
	(c)	Define specific heat at Constant volume, constant pressure and Adiabatic index. Also derive relationship between specific heats in form of Characteristic gas constant.	**07**
Q.2	**(a)**	Discuss the factors responsible for global warming and Ozone depletion	**03**
	(b)	Explain Equivalent evaporation and factor of evaporation	**04**
	(c)	Determine the value of final dryness fraction of steam	**07**

          1. After losing 125 kJ from the steam at constant pressure.
          2. After expansion to 3 bar pressure in a turbine stage and work equivalent of 20 kJ/kg done

Initially steam is available at 7 bar pressure and 0.9 dryness fraction.

OR

	(c)	Three kg of steam at a pressure of 10 bar exists in the following conditions. Calculate its enthalpy and internal energy in each of the cases.	**07**

          1. Steam with x = 0.91
          2. Steam at temperature 200° C

Q.3	**(a)**	Explain the construction and function of Steam Trap with neat sketch. Also mention its specific location in the system.	**03**
	(b)	Derive the equation for efficiency of Carnot	**04**
	(c)	A double acting reciprocating pump has piston diameter of 150 mm and stroke length of 225 mm. the suction and delivery heads are 4 m and 12 m respectively. If the speed of the pump is 80 rpm and the actual quantity of water discharged is 0.61 m^3/min. find the percentage slip, the coefficient of discharge and the power required to drive the pump if the efficiency of the pump is 80%.	**07**

OR

Q.3	**(a)**	Explain the construction and function of Steam separator with neat sketch. Also mention its specific location in the system.	**03**
	(b)	Prove that the efficiency of Otto cycle is greater than that of Diesel cycle for the same compression ratio.	**04**
	(c)	Air is to be compressed in a single stage reciprocating compressor from 1.013 bar and 15° C to 7 bar. Calculate the indicated power required for free air delivery of 0.3 m^3/min when the compression process is	**07**

          1. Isentropic
          2. Reversible isothermal
          3. Polytropic with n = 1.25.

Q.4 **(a)** Draw a neat sketch of p-v diagram for single stage compressor with clearance. **03**

(b) It is required to produce ice from 36° water. The capacity of the ice plan is 6 ton and specific heat of the water is 4.18 KJ/kg.K. Determine the amount of ice produced in 3 hours. **04**

(c) In an ideal Otto cycle the air at the beginning of isentropic compression is at 1 bar and 15°C. The ratio of compression is 8. If the heat added during the constant volume process is 1000 kJ/kg, determine (a) the maximum temperature in the cycle, (b) the air standards efficiency (C) work done per kg of air. **07**

OR

Q.4 **(a)** Draw a neat sketch of p-v diagram showing Free Air Delivery for air compressor. **03**

(b) Calculate the energy consumed in one month for following conditions: **04**
COP of air-conditioning unit : 5
Capacity of air conditioner : 2 TR
No of air conditioners : 8
All air conditioners run for 4 hours/day.

(c) A petrol engine with a stroke length of 200 mm and diameter of 150 mm has a clearance volume of 7×10^5 mm^3. If the indicted thermal efficiency is 0.30, find the relation efficiency. If the effective pressure is 5 bar and engine runs at 1000 rpm. Find the IP of the engine. take $\gamma=1.4$ **07**

Q.5 **(a)** Discuss the operational difference between Vapour compression and Vapour absorption refrigeration cycle **03**

(b) Define velocity ratio of pulleys and discuss effect of slip and creep on motion transmission, **04**

(c) Using neat sketch explain the working of Cone clutch and Centrifugal clutch **07**

OR

Q.5 **(a)** Define following material properties. **03**
1. Ductility
2. Plasticity
3. Malleability

(b) Define pitch circle, diametral pitch, addendum and dedendum using neat sketch. **04**

(c) Using neat sketch explain the working of Block brake and Internal expanding shoe brake. **07**

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