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Total Number of Pages : 02

B.Tech.
BE2103

2nd Semester Back Examination 2017-18

THERMODYNAMICS

BRANCH : AEIE, AERO, AUTO, BIOMED, BIOTECH,
CHEM, CIVIL, CSE, ECE, EEE, EIE, ELECTRICAL, ENV, ETC, FASHION, FAT, IEE, IT,
ITE, MANUFAC, MANUTECH, MARINE, MECH, METTA, METTAMIN, MINERAL, MINING,
MME, PE, PLASTIC, TEXTILE

Time : 3 Hours

Max Marks : 70

Q.CODE : C1038

Answer Question No.1 which is compulsory and any five from the rest.

The figures in the right hand margin indicate marks.

(Steam tables are allowed in the examination hall)

Answer all parts of a question at a place.

Q1 Answer the following questions :

(2 x 10)

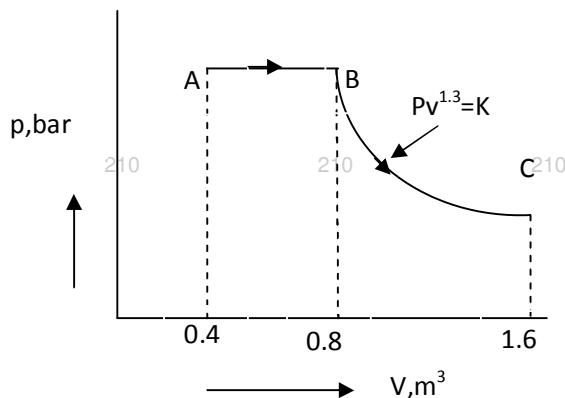
- What do you mean by thermal equilibrium and mechanical equilibrium?
- Differentiate between open system and a control volume.
- What is pressure? Mention the different units of pressure.
- State the Zeroth law of thermodynamics.
- What is free expansion?
- Define C_v and C_p .
- Draw the Carnot cycle on p-v and T-s plot.
- What is the mass of air conditioned in a room $10\text{m} \times 10\text{m} \times 5\text{m}$ if the pressure is 101.325 kPa and the temperature is 25°C .
- Mention the formula for (i) work out put from constant pressure process (ii) heat transfer in polytrophic process
- Write the mass conservation equation in steady flow case. Mention the nomenclatures used in it.

Q2 a) Derive the expression for the pdv work in case of an adiabatic process.

(5)

- Determine the total work done by gas system following an expansion process as shown in the following process.

(5)



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- Q3** a) What is heat transfer? Mention different modes of heat transfer. **(5)**
 b) 500 kg of fish at 10°C are to be frozen and stored at -10°C. the specific heat of fish above freezing point is 3.182 and below freezing point is 1.717kJ/kgK. The freezing point of fish is 0°C, and the latent heat of fusion is 234.5kJ/kg. How much heat must be removed to cool fish, and what percentage of this is latent heat? **(5)**
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- Q4** Air at -15°C passes through a heat exchanger at a velocity of 30m/s where its temperature is raised to 80°C. It then enters a turbine with a velocity of 30 m/s and expands until the temperature falls to 650°C. On leaving the turbine, air is taken at a velocity of 60 m/s to a nozzle where it expands until the temperature has fallen to 500°C. if the air flow rate is 2 kg/s, calculate (i) the rate of heat transfer to the air in the heat exchanger. (ii) the power output from the turbine assuming no heat loss (iii) the velocity exit from the nozzle, assuming no heat loss. Take the enthalpy of air as $h=c_p t$, where c_p is the specific heat equal to 1005J/kgK and t is the temperature. **(10)**
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- Q5** a) State the first law of thermodynamics for closed cycle and a process. **(4)**
 b) Explain the terms: (i) Energy (ii) Enthalpy (iii) Entropy **(6)**
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- Q6** a) State the second law of thermodynamics (both k-P and Clausius statements) **(4)**
 b) If a refrigerator is used for heating purposes in winter so that the atmosphere becomes the cold body and the room to be heated becomes the hot body, how much heat would be available for heating for each kW input to the driving motor? The COP of the refrigerator is 4, and the electromechanical efficiency of the motor is 80%. How does this compare with resistance heating? **(6)**
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- Q7** a) Draw the phase equilibrium diagram for water-steam on p-V, p-T plot with relevant property lines. **(5)**
 b) A vessel of volume 0.04 m³ contains a mixture of saturated water and saturated steam at a temperature 250°C. The mass of the liquid present is 9 kg. Find the pressure, the mass, the enthalpy, the entropy, and the internal energy. **(5)**
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- Q8** Write short notes on (any TWO) **(5 x 2)**
 a) Air compressor
 b) Steam power plant
 c) Internal combustion engines
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