Name:	Roll no.	A	U	2							Marks /35

Write your answers on this sheet and on the answer book. Attach this sheet to the answer book and then submit it.

Instructions:

- All questions are compulsory.
- Figures to right indicate full marks.
- Wherever there is a need, sketch the figure.
- Assume suitable data wherever necessary and specify it clearly in your answers.
- No marks for the answer without the necessary steps written in the answer sheet.
- Only scientific calculator is allowed.

Questions:

Q.1. For the given AC diagram, discuss the following points: [5 Marks]

a) Write down the name of the device present in the AC in the given figure in sections 1, 2, 3 and 4. [Write Section # in one column and Device name in 2nd column to answer in your answer sheet].
b) How many times the working substance changes its phase in AC? Which energy is being absorbed/released when the phase change of working substance occurs?
c) In which component/components of AC, the phase change occurs?
d) Write down that phase change occurs from which phase to another for component/components?
e) Mention if the refrigerant is cool or hot while entering the section 1 and while exiting the section 1? Also report for section 3. [Make 3 columns to answer as section #, Enter and Exit].

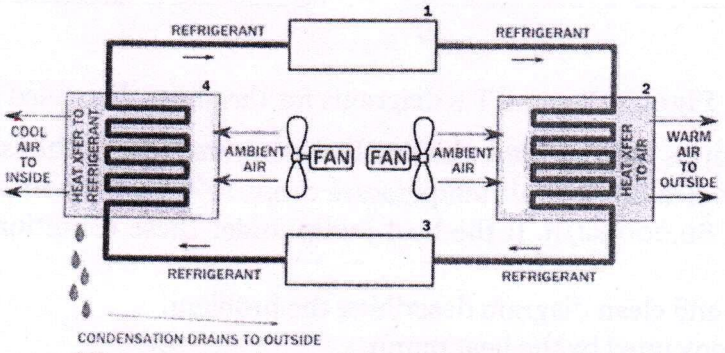


Figure: An air conditioning flow diagram.

Q.2. Match the columns based on the given devices and conversion of energies through it. [5 Marks]

Sr. No.	Device Names	Sr. No.	Conversion of Energies
A.	Engine	P.	Electrical to sound energy
B.	Speaker	Q.	Electrical to mechanical energy
C.	Heater	R.	Heat to mechanical energy
D.	Motor	S.	Electrical to light and sound energy
E.	Television	T.	Electrical energy to heat

Q.3. An air-standard cycle is executed in a closed system and is composed of the following four processes as given below. The executed cycles on the P-v and T-s diagram has been given. Assume that specific heats are constant at the room temperature and find out: [12 marks]

Process 1-2: Isentropic compression from 100 kPa and 27°C to 1 MPa.

Process 2-3: P = *constant* heat addition in amount of 2800 kJ/kg.

Process 3-4: v = *constant* heat rejection to 100 kPa.

Process 4-1: P = *constant* heat rejection to initial state.

The properties of air at room temperature are Cp = 1.005 kJ/kg.K, Cv = 0.718 kJ/kg.K, and k = 1.4, where k is the specific heat capacity ratio. From the ideal gas isentropic relations and energy balance, we can write: $\frac{T}{P^{(k-1)/k}} = Constant.$

a) Write down the assumption except given to solve the problem.
b) Calculate the maximum temperature in the cycle.
c) Determine the thermal efficiency.

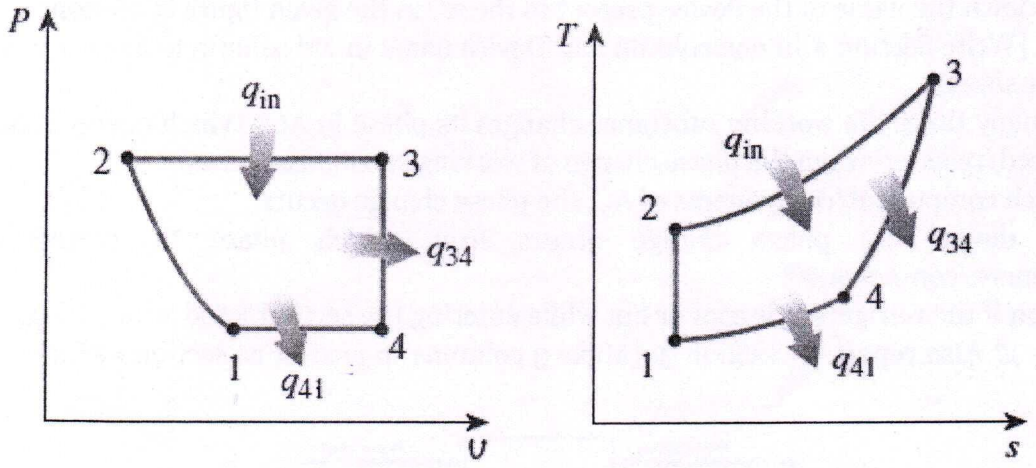


Figure: P-v and T-s diagrams for the above discussed cycles.

Q.4. A heat pump is used to meet the heating requirements of a house and maintain it at 20°C. On a day, when outdoor air temperature drops to -2°C, the house is estimated to lose heat at a rate of 80,000 kJ/h. If the heat pump under these conditions has a COP of 2.5, determine: [8 Marks]

a) Draw a neat and clean diagram describing the problem.
b) The power consumed by the heat pump
c) The rate at which heat is absorbed from the cold outdoor air.

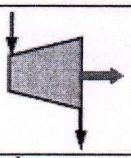
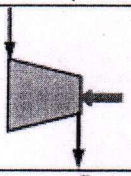
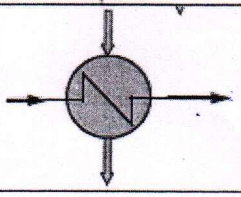
Q. 5. Choose the correct options for the given questions: [3 Marks]

a) Which one is the work producing device?
A. Turbine
B. Compressor
C. Both turbine and compressor
D. None of the above

b) Which one is the work consuming device?
A. Pump
B. Blower
C. Both pump and blower
D. None of the above

c) Write down the following:
A. First law of thermodynamics for closed system .....
B. First law as rate equation .....
C. Clausius inequality for reversible and irreversible cycles .....
D. Second law efficiency for heat engines .....

Q.6. Fill the name of the devices for the given symbols: [2 Marks]

Sr. No.	Devices diagram	Name of the Device
1.		
2.		
3.		
4.		