

Roll No. & Sign:



A Charutar Vidya Mandal's Institution
V.P. & R.P.T.P. SCIENCE COLLEGE
(AUTONOMOUS) (Grant – in – Aid)
Affiliated to Sardar Patel University



Bachelor of Science (Semester – 4) Internal Theory Examination – 2026
US04MAICH01: Energy Balance, Heat Transfer and Industrial Drying

Date: 7th March, 2026

Time: 02:45 PM to 04:15 PM

Day: Saturday

Total Marks: 30 Marks

Q – 1 Answer the following Multiple-Choice Questions. (All are compulsory)

[06]

1. Which of the following is not a form of energy?
(A) Kinetic Energy (B) Potential Energy
(C) Thermal Energy (D) Mass
2. Specific heat is expressed in units of.
(A) J (B) J/kg
(C) J/kg.K (D) J/K
3. Fourier's law of heat conduction states that heat flow is proportional to:
(A) Temperature (B) Temperature difference
(C) Temperature gradient (D) Thermal resistance
4. Fins are provided in heat exchangers to:
(A) Reduce pressure drop (B) Decrease temperature
(C) Increase surface area (D) Increase fluid velocity
5. In a shell and tube heat exchanger, baffles are used to:
(A) Reduce heat transfer (B) Increase shell-side turbulence
(C) Block flow (D) Reduce surface area
6. Drying is a process of removing moisture by:
(A) Filtration (B) Evaporation
(C) Condensation (D) Sedimentation



Q – 2 Explain the various forms of energy and discuss the law of conservation of energy.

[06]

OR

Q – 2 What is fuel? Explain type of fuels and discuss calorific values of fuels (NCV & GCV).

[06]

Q – 3 Derive the equation for Heat flow through a cylinder.

[06]

OR

Q – 3 A furnace is constructed with 200 mm of fire brick, 100 mm of insulating brick and 200 mm of building brick. The inside temperature is 650 °C and the outside temperature is 165 °C. Find the heat loss per unit area and the temperature at the junction of the fire brick and the insulating brick.

[06]

Data: Type of brick 'k' kcal/hr m °C

Fire brick	5.2
Insulating brick	0.5
Building brick	2.0

Q – 4 Describe the construction and working of Internal floating head heat exchanger and discuss their advantages. [06]

OR

Q – 4 Explain the working principle of Plate-type heat exchanger with a neat sketch. [06]

Q – 5 Explain construction and working of Rotary dryer with a neat sketch. [06]

OR

Q – 5 Explain construction and working of Spray dryer with a neat sketch. [06]



Supervisor Signature:

QUIZ TEST

Roll No. & Sign:



A Charutar Vidya Mandal's Institution
V.P. & R.P.T.P. SCIENCE COLLEGE
(AUTONOMOUS) (Grant – in – Aid)
Affiliated to Sardar Patel University



Bachelor of Science (Semester – 4) Internal Theory Examination – 2026

US04MAICH01: Energy Balance, Heat Transfer and Industrial Drying

Date: 7th March, 2026

Time: 02:45 PM to 04:15 PM

Obtain Marks:

Day: Saturday

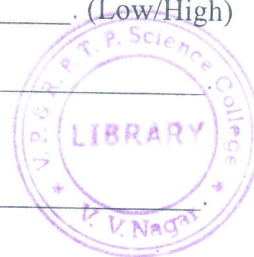
Total Marks: 15 Marks

Examiner Signature:

Note: The figure to the right indicates full marks of the questions.

Q-1 Fill in the blanks with the appropriate answer given in the bracket [8 Marks]

1. The total energy of a system is the sum of internal, kinetic, and _____ energy.
(Potential / neglected)
2. Sensible heat causes a change in _____ without phase change.
(Temperature / Reaction).
3. Thermal conductivity of metals is generally _____ (Low/High)
4. In forced convection, fluid motion is caused by _____
(Density difference/External means like pump or fan)
5. Log Mean Temperature Difference (LMTD) is used in _____
(Radiation problems / Heat exchanger analysis)
6. Plate heat exchangers are best suited for _____
(Compact heat transfer applications / Solid materials)
7. Drying is the process of removing _____ from a solid by evaporation.
(Moisture / Air)
8. Absolute humidity is the mass of water vapour per unit mass of _____ air. (Dry / Wet)



Q-2 State whether the following statement is true or false. [Write answer in the box] [7 Marks]

1. Toothpaste is an example of Pseudo plastic non-Newtonian fluid.
2. The unit of overall heat transfer coefficient (U) is $W / (m^2.K)$
3. For better heat transfer performance, counter flow arrangement is preferred.
4. The steady state condition means Temperature changes with time.
5. A kettle type reboiler is mainly used in distillation column.
6. Drying is purely a mass transfer operation without heat transfer.
7. Relative humidity is always greater than 100%.