



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



Roll No. & Sign:

Bachelor of Science (Semester – 4) Internal Theory Examination – 2026
US04MIICH01: Unit Operations

Date: 10th March, 2026

Time: 02:45 PM to 03:45 PM

Day: Tuesday

Total Marks: 20 Marks

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

[06]

1. Heat transfer through a solid without bulk motion of particles is called:
(A) Convection (B) Radiation
(C) Conduction (D) Evaporation
2. The SI unit of thermal conductivity is:
(A) W/m (B) W/m²K
(C) W/ m.K (D) J/kg.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. A double pipe heat exchanger consists of:
(A) Multiple Tubes in a shell (B) Two concentric Pipes
(C) Parallel flat Plates (D) Spiral Coils



Q – 2 Derive the equation for Heat flow through a cylinder.

[07]

OR

Q – 2 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.

[07]

Data: Type of brick	'k' kcal/hr m °C
Fire brick	5.2
Insulating brick	0.5
Building brick	2.0

Q – 3 Describe the construction and working of Internal floating head heat exchanger and discuss their advantages.

[07]

OR

Q – 3 Explain the working principle of Plate-type heat exchanger with a neat sketch.

[07]

Supervisor Signature:

QUIZ TEST

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Total Marks: 05 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. Thermal conductivity of metals is generally _____. (Low / High)
2. In forced convection, fluid motion is caused by _____.
(Density difference / External means like pump or fan)
3. Log Mean Temperature Difference (LMTD) is used in _____.
(Radiation problems / Heat exchanger analysis)
4. Plate heat exchangers are best suited for _____.
(Compact heat transfer applications / Solid materials)
5. A heat exchanger is a device used to transfer _____ between two fluids. (Heat / Water)

