

Exam Seat No: \_\_\_\_\_



A Charutar Vidya Mandal's Institution  
**V.P. & R.P.T.P. SCIENCE COLLEGE**

(AUTONOMOUS) (Grant – in – Aid)

Affiliated to Sardar Patel University

VALLABH VIDYANAGAR – 388120



**Bachelor of Science (Semester – 4) External Examination – 2026**

**US04MAICH01: ENERGY BALANCE, HEAT TRANSFER AND INDUSTRIAL DRYING**

**Date: 24<sup>th</sup> March 2026**

**Time: 01:45 P.M. TO 04:15 P.M.**

**Day: Tuesday**

**Total Marks: 50 Marks**

Note: The figure to the right indicates the full marks for each question.

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

**[10]**

- The products of complete combustion of hydrocarbons are:  
(A) CO and H<sub>2</sub> (B) CO<sub>2</sub> and H<sub>2</sub>O  
(C) C and H<sub>2</sub>O (D) CO<sub>2</sub> and CH<sub>4</sub>
- Air supplied greater than theoretical air is called:  
(A) Deficit air (B) Stoichiometric air  
(C) Excess air (D) Saturated air
- Heat transfer through a solid without movement of material is called:  
(A) Convection (B) Radiation  
(C) Conduction (D) Diffusion
- Heat transfer by bulk movement of fluid is known as:  
(A) Convection (B) Radiation  
(C) Conduction (D) Diffusion
- In a shell and tube heat exchanger, one fluid flows through:  
(A) Plates (B) Tubes  
(C) Shell only (D) Insulation
- A plate-type heat exchanger consists of:  
(A) Series of metal plates (B) Cylindrical tubes  
(C) Graphite blocks (D) Concentric pipes
- Graphite block heat exchangers are used mainly for:  
(A) High-pressure gases (B) Corrosive fluids  
(C) Steam heating (D) Water cooling
- Equilibrium moisture content is the moisture content at which:  
(A) Drying stops (B) Drying starts  
(C) Moisture content increases (D) Heat transfer stops
- The constant rate drying period is controlled mainly by:  
(A) Internal diffusion (B) Surface evaporation  
(C) Chemical reaction (D) Pressure difference
- Spray dryers are widely used in:  
(A) Dairy industry (B) Cement industry  
(C) Mining industry (D) Petroleum refining



❖ Answer The Following Long Questions

- Q – 2 [A] Explain the various forms of energy and discuss the law of conservation of energy. [05]  
[B] Define heat capacity and specific heat. Explain energy balances for open & close system. [05]

OR

- Q – 2 [A] Explain relationship between  $C_p$  and  $C_v$  for an ideal Gas. [05]  
[B] Explain heat capacities of gaseous mixtures. [05]

- Q – 3 [A] Derive the equation for heat flow through a cylinder under steady-state conditions. [05]  
[B] State and explain Fourier's law of heat conduction and discuss how thermal conductivity varies among different materials. [05]

OR

- Q – 3 [A] Derive and discuss the steady-state one-dimensional heat conduction equation for a plane wall, mentioning all assumptions. [05]  
[B] Explain heat conduction through composite walls and illustrate how thermal resistance is used to compute overall heat loss. [05]

- Q – 4 [A] Write a detailed note on Kettle type Reboiler with a neat sketch. [05]  
[B] Write a note on Internal floating head heat exchanger. [05]

OR

- Q – 4 [A] Describe the construction and working of double-pipe heat exchangers and discuss their advantages and limitations. [05]  
[B] Write a difference between Single pass and Multi pass shell and Tube heat exchanger. [05]

- Q – 5 [A] Explain construction and working of Rotary dryer with a neat sketch. [05]  
[B] Explain construction and working of Drum dryer with a neat sketch. [05]

OR

- Q – 5 [A] Explain construction and working of Tunnel dryer with a neat sketch. [05]  
[B] Explain construction and working of Tray dryer with a neat sketch. [05]

