

GUJARAT TECHNOLOGICAL UNIVERSITY**BE – SEMESTER- VII EXAMINATION-SUMMER 2023****Subject Code: 3170516****Date: 30/06/2023****Subject Name: Process Auxiliaries and utilities****Time: 10:30 AM TO 01:00 PM****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

- Q.1** (a) Draw the standard symbols of the following as used in process flow diagram: (i) Control valve (ii) Heat exchanger (iii) packed column **03**
- (b) Draw the differences between a block diagram, process flow diagram and P& I diagram. **04**
- (c) Draw the diagram of a basic control loop and label different units. Name the abbreviated forms of two commonly used control systems in industry? **07**

- Q.2** (a) State the characteristics of steam which makes it so popular and useful in industry. **03**
- (b) Name four different types of pipe joints and state one feature for each. **04**
- (c) Discuss the use of various types of pipe fittings with neat sketches. **07**

OR

- (c) State the selection criteria of valves. Enlist important types of valves and their salient features used in chemical processes. **07**

- Q.3** (a) Classify piping insulation based on function and materials type. **03**
- (b) Explain hot and cold insulation with examples and schematics. **04**
- (c) Discuss tertiary treatment of wastewater with special reference to nitrogen and phosphorus removal, nitrification and denitrification **07**

OR

- Q.3** (a) Calculate allowable internal pressure P for Schedule 40 mild steel pipe having ultimate tensile strength (S value) of 65,300 psi. (Assume suitable data if required) **03**
- (b) Define steam economy. Explain how you would calculate steam economy in an evaporator. **04**
- (c) What is meant by 'Condensate recovery'? Discuss the benefits of condensate recovery with special reference to its positive impact on safety and the environment. **07**

- Q.4** (a) Name various types of chillers used in chemical processes. **03**
- (b) State the benefits of waste heat recovery. **04**
- (c) Enlist various commercial devices used in industry for waste heat recovery. Discuss the working of any one in brief. **07**

OR

- Q.4** (a) State the reasons for the probable loss of steam pressure through the distribution pipeline. **03**

- (b) List out desirable characteristics of a heat transfer fluid. Give examples. **04**
- (c) What are steam traps? Classify steam traps and explain the principle of any one type of steam trap. **07**
- Q.5** (a) Why nitrogen is used for purging? **03**
- (b) Discuss application of steam in important chemical reactions with examples. **04**
- (c) Explain nitrogen blanketing or padding for storage tank with a diagram. **07**
What is the effect of limiting oxygen concentration on nitrogen blanketing?
- OR**
- Q.5** (a) Define COP of a refrigerator. **03**
- (b) State four factors for the choice of refrigerant. **04**
- (c) Discuss vapor compression refrigeration cycle with a diagram. **07**
