

# GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-V EXAMINATION – SUMMER 2025

**Subject Code:3151709**

**Date:20-05-2025**

**Subject Name:Process Instrumentation**

**Time:02:30 PM TO 05:00 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.

|            |                                                                                                                                               | MARKS     |
|------------|-----------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| <b>Q.1</b> | <b>(a)</b> Define the following terminology – (1) Plug (2) Rangeability (3) Yoke.                                                             | <b>03</b> |
|            | <b>(b)</b> Draw ISA symbols for following (1) Butterfly valve (2) Electric Line (3) Water cooled condenser (4) Damper.                        | <b>04</b> |
|            | <b>(c)</b> Discuss in brief design layout for control room with suitable diagram.                                                             | <b>07</b> |
| <b>Q.2</b> | <b>(a)</b> Explain with diagram about different Control valve flow characteristics.                                                           | <b>03</b> |
|            | <b>(b)</b> Explain the Electrical power system requirement for control room.                                                                  | <b>04</b> |
|            | <b>(c)</b> What is an Actuator? Explain different types of Actuator in details.                                                               | <b>07</b> |
|            | <b>OR</b>                                                                                                                                     |           |
|            | <b>(c)</b> Explain function & types of annunciators.                                                                                          | <b>07</b> |
| <b>Q.3</b> | <b>(a)</b> Differentiate between single port & double port design of globe valve.                                                             | <b>03</b> |
|            | <b>(b)</b> Explain any one non lubricant compressor in detail.                                                                                | <b>04</b> |
|            | <b>(c)</b> Brief about pressure relieving devices. Discuss Safety Valves in detail.                                                           | <b>07</b> |
|            | <b>OR</b>                                                                                                                                     |           |
| <b>Q.3</b> | <b>(a)</b> Explain instrumentation air supply in detail.                                                                                      | <b>03</b> |
|            | <b>(b)</b> Explain desiccant type dryer with suitable diagram.                                                                                | <b>04</b> |
|            | <b>(c)</b> Give the classification of control panels. Explain Break Front Panel with sketch.                                                  | <b>07</b> |
| <b>Q.4</b> | <b>(a)</b> Explain F to V converter in detail.                                                                                                | <b>03</b> |
|            | <b>(b)</b> Explain the working of rupture discs.                                                                                              | <b>04</b> |
|            | <b>(c)</b> List out various control valve accessories. Explain any three control valve accessories with figure and its role in control valve. | <b>07</b> |
|            | <b>OR</b>                                                                                                                                     |           |
| <b>Q.4</b> | <b>(a)</b> Explain P to I converter in detail.                                                                                                | <b>03</b> |
|            | <b>(b)</b> Explain force balance pneumatic transmitter in detail.                                                                             | <b>04</b> |
|            | <b>(c)</b> Explain butterfly valve in detail.                                                                                                 | <b>07</b> |
| <b>Q.5</b> | <b>(a)</b> Justify an application of Angle and Needle types control valves in process plant control system.                                   | <b>03</b> |
|            | <b>(b)</b> Classify hazardous area and material according to N. E. C.                                                                         | <b>04</b> |
|            | <b>(c)</b> Define recorder. Explain types of recorder with neat diagram. Enlist merit and demerits of recorders.                              | <b>07</b> |

|            |            |                                                                                                                                                                 |           |
|------------|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
|            |            | <b>OR</b>                                                                                                                                                       |           |
| <b>Q.5</b> | <b>(a)</b> | Why is it necessary to give tag number to field instruments? Give the general guidelines one have to follow while assigning the tag no to any field instrument. | <b>03</b> |
|            | <b>(b)</b> | Draw and describe the working of 2-wire transmitter and 4-wire transmitter.                                                                                     | <b>04</b> |
|            | <b>(c)</b> | What is the meaning of S.M.A.R.T. in transmitter terminology? Discuss the operation of SMART transmitter with its construction and salient features.            | <b>07</b> |

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