

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-V(New) • EXAMINATION – WINTER 2016

Subject Code:2151402

Date:19/11/2016

Subject Name:Food Process Instrumentation & Control

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.**

Q.1

Short Questions

14

1. What is dead zone?
2. A DC voltmeter has sensitivity of $1000 \Omega / V$. When it measure half full scale in 100 V range. The current through the voltmeter will be
 - (a) 0.5 mA
 - (b) 50 mA
 - (c) 100 mA
 - (d) 1 mA
3. Define vena contracta
4. Accuracy is defined as the
 - (a) smallest measurable input change.
 - (b) measure of the consistency or reproducibility of the measurement.
 - (c) closeness with which an instrument reading approaches the true value of the quantity being measured.
 - (d) ratio of the change in output signal of an instrument to a change in the input.
5. The span of a zero centred voltmeter having a scale from $- 10 V$ to $+ 10 V$ is
 - (a) 10 V
 - (b) $- 10 V$
 - (c) 20 V
 - (d) 0 V
6. Undesirable characteristic of a measurement system are
 - (a) static error.
 - (b) dead zone and drift
 - (c) accuracy and repeatability
 - (d) A and B both
7. The degree of reproducibility among several independent measurement of

same true value under reference condition is known as

- (a) linearity
- (b) precision
- (c) accuracy
- (d) calibration

8. The dead zone in certain pyrometer is 0.5 % of span. The calibration is 600° C to 1000° C. What temperature change might occur before it is detected?

- (a) 2° C
- (b) 4° C
- (c) 0.1° C
- (d) 0.2° C

9. An instrument reads 127.50 V and the true value of the voltage is 127.43 V.

What is the static correction for this instrument?

- (a) 0.07 V
- (b) – 0.07 V
- (c) 127.50 V
- (d) 127.43 V

10. What is transducer?

11. Mention temperature range of K type thermocouple.

12. The operation of a rotameter is based on

- (a) pressure at stagnation point
- (b) rotation of a turbine
- (c) pressure drop across a nozzle
- (d) variable flow area

13. Transfer function equation of first order system.

14. Define specific gravity.

- Q.2**
- (a) State principle of rotating concentric cylindrical viscometer and explain its working. **03**
 - (b) Give the working principle of McLeod gauge with labeled diagram. **04**
 - (c) Enumerate commercial scales to measure specific gravity? What are hydrometer? LVDT type hydrometer with diagram. **07**

OR

- (c) What is the importance of pressure measurement in beverages industry? Explain the working of differential U-tube manometer. **07**

- Q.3**
- (a) Explain Construction of orifice plate with figure. **03**
 - (b) Draw and describe in brief about pycnometer. **04**
 - (c) What is the difference between turbidity and colour from the measurement technique point of view? Explain the difference between basic turbidity meter and light scattering turbidity meter with diagram. **07**

OR

- Q.3 (a)** Derive transfer function equation for first order system mercury in glass thermometer. **07**
- (c)** From Bernoulli's theorem obtain an expression for flow rate of a one dimensional incompressible fluid flow through a horizontal pipe installed with an orifice meter. **07**
- Q.4 (a)** Define and draw an output vs input graph of Sensitivity and Hysteresis **03**
- (b)** What is resistance strain gauge? Differentiate between balanced and unbalanced bridge. **04**
- (c)** Enumerate types of moisture present in grains. Explain in detail drying theory along with Infrared drying technique. **07**
- OR**
- Q.4 (a)** What is the difference between First and second order systems? Derive an equation for any first order system **07**
- (b)** Derive transfer function equation for Two non interacting tanks. **07**
- Q.5 (a)** In a mixing tank the ratio of solvent to solute is to be maintained that is 10:2. Draw a control loop to maintain the same for a given mixing tank. **03**
- (b)** Calculate standard deviation, consider a sample of temperature in °C given by a thermocouple 96, 104, 126, 134 and 140. **04**
- (c)** Describe in brief about Feed forward control loop with example. **07**
- OR**
- Q.5 (a)** Define laplace transform and why is it used ? **07**
Solve $(dx/dt) + x = 1$
Where $x(0) = 0$
- (b)** Describe in brief about bode diagram of stability with graph. **07**
