

## SARDAR PATEL UNIVERSITY VALLABH VIDYANAGAR

B.Sc. Semester-VI Examination: April 2018

Subject Code: US06CPHY06

Subject Title: Instrumentation and Sensors

Date: 06-04-2018 Friday

Time: 10.00 a.m. to 01.00 p.m.

Marks: 70

**Q. 1 Answer following MCQs with most correct option: (Each of 1 Mark) (10)**

1. What can be measured using a cathode ray oscilloscope (CRO) ?  
(a) frequency (b) voltage (c) phase angle (d) all of these
2. In the LVDT type of transducer ..... core provides magnetic coupling between primary and secondary coils.  
(a) hard iron (b) high permeability steel (c) soft iron (c) low permeability steel
3. A photomultiplier tube is an example of ..... transducer  
(a) photovoltaic (b) photoemissive (c) photoconductive (d) none of these
4. In ionization transducer the electric field is generated by ..... generator.  
(a) RF (b) Microwave (c) UHF (d) Ultrasonic.
5. What is suitable for moderate pressure measurements?  
(a) McLeod gage (b) pirani gage (c) ionization gage (d) manometer
6. The bimetallic strip can be most suitable primary sensor for ..... measurement.  
(a) pressure (b) mass (c) temperature (d) radiation
7. Which of the followings exhibits positive temperature coefficient of resistance?  
(a) semiconductor (b) platinum (c) thermistor (d) all of these
8. Which of the followings used as a carrier gas in a gas chromatograph?  
(a) helium (b) nitrogen (c) oxygen (d) argon
9. Microphones generally convert ..... signal to motion signal.  
(a) electrical (b) pressure (c) temperature (d) electromagnetic
10. Dye densitometry is a method to measure.....  
(a) blood pressure (b) blood flow rate (c) oxygen saturation in blood (d) glucose

**Q.2 Answer any TEN of the following questions in short: (Each of 2 Mark) (20)**

1. Draw schematic of a cathode ray tube (CRT) and state function of its main components.
2. Explain important factors for selection of a electromechanical transducer.
3. For a certain conductor, resistance changes from  $1 \Omega$  to  $1.1 \Omega$  when its length changes from 1cm to 1.1cm. Determine its gage factor.
4. State and explain principle of Pirani gage or thermal conductivity gage.
5. Explain principle of a manometer and state characteristics of manometer fluid..
6. Explain principle of high pressure measurements.
7. What is a thermocouple? Explain its principle.
8. Draw labeled diagram of metallic resistance thermometer. Why platinum is more used in such devices?
9. Draw labeled diagram of disappearing filament type of pyrometer.
10. What is a smart sensor? State its features.
11. Draw Orsat gas analysis apparatus and label its parts.
12. What are optical fiber chemical sensors? Explain.

**Q.3(a)** State principle of inductive type transducers and explain various types of non self generating inductive transducers. (06)

**Q.3(b)** What are capacitive type transducers? Write a note on it. (04)

**OR**

**Q.3(a)** Explain electrostatic deflection of an electron beam and show that in a Cathode ray tube of a CRO path of an electron reaching the screen is parabolic. (06)

**Q.3(b)** Draw labeled diagram of Cathode Ray Oscilloscope and mention function of its main components (04)

**Q.4** What are opto-electrical transducers? Explain various types of them with necessary diagram. (10)

**OR**

**Q.4** Explain (i) McLeod gage and (ii) ionization gage for low pressure measurements with proper diagram. (10)

**Q.5(a)** State methods for temperature measurements. Explain principle construction and working of a solid rod thermometer. State its applications. (06)

**(b)** Write a note on bimetallic thermometers. (04)

**OR**

**Q.5(a)** What is a total radiation pyrometer? Write a note on it. (06)

**(b)** What is a thermistor? Explain different forms of thermistors and state their advantages. (04)

**Q.6(a)** What is a non-dispersive infra-red gas analyzer? With schematics explain its construction and working. (06)

**(b)** Explain importance of optical fiber sensors in medical field. (04)

**OR**

**Q.6(a)** What are microphones? Write a note on (i) Condenser type and (ii) Carbon Microphone. (06)

**(b)** What are biosensors? Write a note on their features. (04)