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SARDAR PATEL UNIVERSITY VALLABH VIDYANAGAR

B.Sc. (Physics) Semester-VI (2011Batch onwards CBCS) Examination: **April 2016**

Subject Code: **US06CPHY06** Subject Title: Instrumentation and Sensors

Date: **09-04-2016 Saturday** Time: 02.30 p.m. to 5.30 p.m. Marks: 70

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

1. The output voltage of an eddy current type transducer is proportional to
   (a) rate of change of eddy current (b) acceleration of plate
   (c) both (a) and (b) (d) none of these
2. When material like Ni is subjected to tension, its magnetic permeability … .
   (a) remains unchanged (b) increases (c) decreases (d) becomes infinite.
3. The calibrated horizontal and vertical marks or linings placed on the CRT screen to facilitate the use of CRO are known as ……
   (a) deflection pattern (b) phosphor (c) graticules (d) squares.
4. Which of these gages is a modified mercury manometer?
   (a) McLeod (b) ionization (c) Knudsen (d) pirani
5. A photomultiplier tube is a ……. type of transducer.
   (a) photo-conductive (b) photo-emissive (c) photo-voltaic (d) ionization
6. Which is employed as sensing element wire in high pressure measurements?
   (a) copper (b) aluminum (c) gold-chrome (d) nickel
7. The most suitable primary sensor for temperature measurement is …..
   (a) bimetallic strip (b) diaphragm (c) elastic cantilever (d) bourdon gage
8. Typically, thermistors are …… sensitive than metallic resistance thermometers.
   (a) 10 times less (b) 10 times more (c) equally (d) 20 times less
9. In bio medical-temperature sensors ……. crystal is used as a sensing element.
   (a) GaP (b) GaS (c) GaAs (d) GaAsP
10. Which of the following is used as an enzyme in a blood glucose monitor?
    (a) H_2O_2 (b) gluconic acid (c) glucose (d) glucose oxidase

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

1. Draw schematic of potentiometric resistance type transducer and state its principle.
2. Draw labeled block diagram of a Cathode Ray Oscilloscope.
3. With schematic diagram explain principle of thermal conductivity or pirani gage.
4. Draw the schematic of mechano-electronic transducer and state its principle.
5. Draw the schematic of photoconductive transducer and state its principle.
6. What is a thermo-emf? On what factors it depends?
7. What are thermistors? State their features.
8. Why optical fiber sensors are preferred? Explain.
9. Explain principle of basic chemical sensors.
10. What is a bio-sensor? Sate its features.
11. A quartz crystal is having a charge sensitivity of 2 pC/N , dielectric constant of 4.5 and Young's modulus of 9×10^{10} Pa. Find its voltage sensitivity constant.
12. A thermocouple is having a linear calibration between 0 to 400^0 C with emf of 20 mV at 400^0 C (with ref. junction at 0^0 C). When its hot junction is connected to a temperature source (with ref.junction at 0^0 C) it gives output of 12 mV. Find the temperature at the hot junction.

(P.T.O.)

Q.3	State principle of inductive type transducers and classify them. Discuss various types of inductive transducers.	(10)
	OR	
Q.3	State applications of cathode ray oscilloscope (CRO). Show that in a cathode ray tube of a CRO, path of an electron reaching the screen is parabolic. Derive expression for its deflection factor.	(10)
Q.4(a)	Explain principle of opto-electrical transducers and explain photo-emissive and photovoltaic types transducers.	(06)
(b)	With schematics explain construction and working principle of ionization gage.	(04)
	OR	
Q.4(a)	State principle of McLeod gage and with necessary diagram explain its construction and working.	(06)
(b)	Explain inclined tube type of manometer.	(04)
Q.5(a)	Explain principle and working of disappearing filament type of optical pyrometer.	(06)
(b)	Draw schematic diagram of a solid rod thermometer and state its features.	(04)
	OR	
Q.5(a)	Sate electrical methods for temperature measurements. Explain Metallic resistance thermometer.	(06)
(b)	Draw schematic diagram of total radiation pyrometer and state its features.	(04)
Q.6(a)	Draw schematic of Orsat apparatus for exhaust gas analysis and explain its application.	(05)
(b)	Write a note on Carbon Microphone.	(05)
	OR	
Q.6(a)	Write a note on Electrodynamic Microphone.	(05)
(b)	Draw schematic of non-dispersive infra-red gas analyzer. State its features.	(05)

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