**A** **Reg. No. :** | | | | | | | | | | |

## Question Paper Code: 52B09

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2019

Second Semester

Biomedical Engineering

15UBM209 - SENSORS AND MEASUREMENT TECHNIQUES

(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. Which of the following is not covered under Mechanical energy domain? CO1-R

   (a) Distance (b) Latent heat (c) Force (d) Size

2. The following main dynamic characteristic(s) is usually considered in Mechatronics application of sensors. CO1-R

   (a) Response time (b) Rise time (c) Time constant (d) All of the above

3. The ability to give same output reading when same input value is applied repeatedly is known as CO2-R

   (a) Stability (b) Resolution (c) Error (d) Impedance

4. Following is not an example of transducer. CO2-R

   (a) Analogue voltmeter (b) Thermocouple

   (c) Photo electric cell (d) Pneumatic cylinder

5. Following is (are) true for Hall Effect sensors. CO3-R

   (a) Linear Hall Effect sensor (b) Threshold Hall Effect sensor

   (c) Both (A) and (B) (d) None of the above

6. Any radiation of appropriate wavelength fall on the depletion layer of p-n junction develops a potential difference between the junction' is working principle of CO3-R

   (a) Hall Effect sensor (b) Proximity sensor

   (c) Light sensor (d) All of the above

7. Following type of sensors are used to generate information in object grasping and obstacle avoidance. CO4-R

(a) Hall Effect sensor (b) Proximity sensor

(c) Light sensor (d) Optical sensors

8. Inductive proximity sensors can be effective only when the objects are of _____ materials. CO4-R

(a) Ferro magnetic (b) Diamagnetic (c) Paramagnetic (d) All of the above

9. A piezo-electrical crystal generates voltage when subjected to ____ force. CO5-R

(a) Electrical (b) Mechanical (c) Gravity (d) All of the above

10. Following acts as detector in Optical sensor CO5-R

(a) Light emitting diode (b) Photo diode

(c) Transistor (d) All of the above

PART – B (5 x 2= 10Marks)

11. What are the basic elements of a measurement system? CO1-R

12. What is meant by strain gauge? What for it is used? CO2-R

13. Which are the materials used in piezo-electric transducer? CO3-R

14. What are the applications of recorders? CO4-R

15. What is Kelvin's double bridge? CO5-R

PART – C (5 x 16= 80Marks)

16. (a) Discuss in detail the various static and dynamic characteristics of a measuring system. CO1-U (16)

Or

(b) Discuss in detail various types of errors associated in measurement and how these errors can be minimized? CO1-U (16)

17. (a) Explain in detail about the various types of temperature transducers. CO2-U (16)

Or

(b) Explain the construction and working of LVDT with a neat sketch CO2 -U (16)

18. (a) Describe the piezoelectric transducer and give the formula for coupling coefficient CO3 -U (16)

Or

(b) Discuss in detail about the MEMS and Nano sensors CO3 -U (16)

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| 19. | (a) | Explain the basic elements of a magnetic tape recorder with a neat diagram. | CO4 -U | (16) |
| | | Or | | |
| | (b) | Discuss in detail the construction of a storage type oscilloscope. What are the accessories for a CRO? | CO4 -U | (16) |
| 20. | (a) | With fundamentals distinguish between DC and AC potentiometers, and give any two specific applications for each. | CO5-U | (16) |
| | | Or | | |
| | (b) | Explain the working principle of Anderson's bridge and also derive its balance equations | CO5-U | (16) |