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**Question Paper Code:U3B05**

B.E./B.Tech. DEGREE EXAMINATION, APRIL 2024

Third Semester

Biomedical Engineering

21UBM305– SENSORS AND MEASURING TECHNIQUES

(Regulations 2021)

Duration:3.00hours

Maximum:100Marks

Answer ALL Questions

PART A-(10 x2=20 Marks)

1. What is active transducer? CO1-U
2. What are primary and secondary standards? CO1-U
3. What are the different principles used in capacitive transducer? CO1-U
4. Compare thermistor and RTD. CO3-Ana
5. Compare the characteristics of photo diode and photo transistor. CO3-Ana
6. Mention the spectro photometric applications of photo electric transducer. CO1-U
7. What is the need of bridges in measurement system? CO1-U
8. List the advantages of AC Bridge. CO1-U
9. Name two types of analog to digital converters used in DVM design. CO1-U
10. Differentiate between CRO & DSO. CO3-An

PART– B(5X 16= 80Marks)

11. (a) Discuss the static and dynamic characteristics of transducers. CO1-U (16)
- Or
- (b) Explain the different type of errors in measurement systems. CO1-U (16)

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12. (a) Explain the construction, working, characteristics and biomedical applications of Strain gauges. CO1-U (16)
- Or
- (b) Describe the working principle and characteristics of thermocouple. CO1-U (16)  
Also explain the cold junction compensation in thermocouple.
13. (a) (i) Describe the construction and working of photomultiplier tube. CO1-U (8)
- (ii) Compare the different types of photoelectric transducers. CO3-Ana (8)
- Or
- (b) (i) Explain the construction, characteristics and biomedical application of Photovoltaic cell. CO1-U (8)
- (ii) Briefly analyze the spectro-photometric applications of photoelectric transducers. CO3-Ana (8)
14. (a) (i) What are the different problems associated with the measurement of low resistance? With necessary illustrations explain the working principle of Kelvin's double bridge. CO1-U (8)
- (ii) The arms of an a.c. Maxwell bridge are arranged as follows: AB is a non-inductive resistance of  $1,000\Omega$  in parallel with a capacitor of capacitance  $0.5\mu\text{F}$ , BC is a non-inductive resistance of  $600\Omega$  CD is an inductive impedance (unknown) and DA is a non-inductive resistance of  $400\Omega$ . If balance is obtained under these conditions, find the value of the resistance and the inductance of the branch CD. CO2-App (8)
- Or
- (b) (i) Describe the working of Function generator. CO1-U (8)
- (ii) An AC bridge was made up as follows: arm AB, a capacitor of  $0.8\mu\text{F}$  in parallel with  $1\text{k}\Omega$  resistance, BC a resistance of  $3\text{k}\Omega$ , arm CD an unknown capacitor  $C_x$  and  $R_x$  in series, arm DA a capacitance of  $0.4\mu\text{F}$ . The supply at  $1\text{kHz}$  is connected across BD and a detector across AC. Determine the value of unknown capacitance  $C_x$ , unknown series resistance  $R_x$  and dissipation factor. CO2-App (8)

15. (a) (i) Explain the block diagram of dual slope type DVM. CO1-U (8)
- (ii) Draw the block diagram of CRO and explain the function of each block. CO1-U (8)

Or

- (b) (i) Briefly discuss the working of X-Y recorder. CO1-U (8)
- (ii) Draw the complete block diagram of DSO and explain in detail how it is used for measuring bio-signal. CO1-U (8)

