Reg. No. \_\_\_\_\_\_\_\_\_\_\_\_



**End Semester Examination – Nov / Dec – 2019**

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| **Code :** | **17BM2002** | **Duration :** | **3hrs** |
| **Sub. Name :** | **BIOMEDICAL SENSORS AND TRANSDUCERS** | **Max. Marks :** | **100** |

**ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | With a neat diagram, explain the functional blocks of a generalized Biomedical Instrumentation System. | CO1 | 10 |
| b. | Give the classification of Biomedical Sensors and mention the function of each type. | CO1 | 5 |
| c. | The accuracy specified for a pressure gauge of range (0-10) kPa is 2%. Find the maximum error in measurement in Pa if it gives a reading of 4.0 kPa. | CO2 | 5 |
| **(OR)** | | | | |
| 2. | a. | Bring out the importance of error analysis in measurement systems. Classify the errors in measurement and explain with suitable example. | CO2 | 10 |
| b. | Draw the equivalent circuit of a Biomedical sensor and derive the condition for maximum power transfer at the sensor – amplifier interface. | CO1 | 10 |
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| 3. | a. | Enumerate the factors that affect the capacitance. With relevant diagrams and explanations, illustrate how it can be used for pressure measurement. Bring out its biomedical applications. | CO3 | 10 |
| b. | State Seebeck Effect. Elaborate on its application for temperature measurement. Illustrate its biomedical applications. | CO3 | 10 |
| **(OR)** | | | | |
| 4. | a. | What is piezoelectric effect? Draw the equivalent circuit of a piezoelectric transducer and derive its transfer function. Mention its Biomedical Applications. | CO5 | 15 |
| b. | Illustrate the applications of thermal sensors in physiological measurement. | CO5 | 5 |
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| 5. | a. | Give a brief account of the Ionic Basis of Resting Potential and the generation of action potential. | CO4 | 10 |
| b. | With neat diagrams, enumerate the types of chemoreceptors and explain the function of anyone type. | CO4 | 10 |
| **(OR)** | | | | |
| 6. | a. | Write briefly the functions of mechanoreceptors. Write a short note on the Electrical Activity of Pacinian Corpuscles. | CO5 | 10 |
| b. | Elaborate the working of photoreceptors in the human body and explain the structure and function of Retina. | CO5 | 10 |
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| 7. | a. | Mention the significance of Half Cell Potential. Highlight the functionality of Hydrogen Electrode and Calomel Electrode as Reference Electrodes. | CO4 | 15 |
| b. | Draw the Equivalent Circuit of Electrode Skin Interface and mention its function. | CO4 | 5 |
| **(OR)** | | | | |
| 8. | a. | With a neat diagram, illustrate the operation and applications of Ion Exchange Membrane. | CO6 | 10 |
| b. | Write a note on planar ISFET sensors. | CO6 | 10 |
|  | | **Compulsory**: |  |  |
| 9. | a. | Draw the schematic layout of a Biosensor and give its classification. | CO5 | 10 |
| b. | Give the principle of Optical Biosensors and explain any two types. Mention their advantages and disadvantages. | CO6 | 10 |