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PRESIDENCY UNIVERSITY BENGALURU

 SCHOOL OF ENGINEERING

 MAKE-UP EXAMINATION – JULY 2024

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| **Semester : V& VI** | **Date : 10/07/2024** |
| **Course Code : ECE3034** | **Time : 9:30 AM -12:30 PM** |
| **Course Name : Biomedical Instrumentation** | **Max Marks : 100** |
| **Program : BTech** | **Weightage : 50%** |

**Instructions:**

1. *Read all questions carefully and answer accordingly.*
2. *Question paper consists of 3 parts.*
3. *Scientific and non-programmable calculator are permitted.*
4. *Do not write any information on the question paper other than Roll Number.*

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| **PART A** |
|  **ANSWER ANY 5 QUESTIONS 5Q X 2M=10M** |
| 1 | Transducers are devices which convert variations in physical quantity which is non – electrical such as temperature, pressure, sound, light etc into an equivalent electrical signal. The Piezoelectric transducer is an ……….. used for conversion of pressure or mechanical stress into an alternating …………….  | (CO 1) | [Knowledge] |
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| 2 | Name the instrument that detects and records heart sounds, the sounds made by the various cardiac structures pulsing and moving blood. . | (CO 1) | [Knowledge] |
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| 3 | There are different categories of brain waves, which are characterized by their differences in frequency and amplitude.  Which rhythm is the principal component of the EEG that indicates the alertness of the brain? | (CO 2) | [Knowledge] |
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| 4 | Which is the instrument used for recording the electrical activity of the muscles to determine whether the muscle is contracting or not. | (CO 2) | [Knowledge] |
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| 5 | Name the instrument that measure the difference in time from when an ultrasonic signal is transmitted from the first transducer until it crosses the pipe and is received by the second transducer.  | (CO 3) | [Knowledge] |
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| 6 | A change within a cell, during which the cell undergoes a shift in electric charge distribution, resulting in less negative charge inside the cell compared to the outside. What is this phenomenon called?  | (CO 3) | [Knowledge] |
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| 7 | What are the devices that convert ionic potentials into electronic potentials called. | (CO 4) | [Knowledge] |
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| **PART B** |
|  **ANSWER ANY 5 QUESTIONS 5Q X 10M=50M** |
| 8 | A sphygmomanometer, also known as blood pressure monitor, is a medical device used to measure blood pressure. Pressure at which Korotkoff sounds start and stops are observed to note the pressures. Describe the procedure of sphygmomanometer method of arterial blood pressure measurement. | (C.O.No.2)  |  [Comprehension]  |
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| 9 | Strain gauges are transducers which convert the input strain into corresponding change in resistance. With the help of derivation show the importance of gauge factor of a strain gauge. | (C.O.No.1)  |  [Comprehension]  |
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| 10 | The electrocardiograph (ECG) is an instrument, which records the electrical activity of the heart. With the help of neat block diagram of Electrocardiograph describe it’s working. | (C.O.No.3)  |  [Comprehension]  |
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| 11 | A therapeutic device is an instrument or apparatus used to diagnose, prevent, and treat diseases or impairments. By giving external electrical stimulation impulses to the heart muscles, it is possible to regulate the heart rate. Describe how this can be achieved by using Ventricular synchronous demand pacemaker with a neat block diagram. | (C.O.No.4)  |  [Comprehension]  |
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| 12 | Instrumentation amplifiers are precision, integrated operational amplifiers that have differential input and single-ended or differential output. Describe with help of circuit diagram, the working of a typical instrumentation amplifier listing its important characteristics. | (C.O.No.1)  |  [Comprehension]  |
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| 13 | In 1905, Russian surgeon Nikolai Korotkoff first described the technique to measure diastolic pressure using a stethoscope. Define Blood pressure. Name the instrument used to measure blood pressure. Describe the systolic pressure and diastolic pressure with suitable waveform. | (C.O.No.2)  |  [Comprehension]  |
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| 14 | The resistive transducer is used for measuring physical quantities like temperature, displacement, vibration etc. Sketch the diagram and equivalent circuit of a potentiometric displacement transducer and briefly explain its operation.  | (C.O.No.1)  |  [Comprehension]  |
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| **PART C** |
|  **ANSWER ANY 2 QUESTIONS 2Q X 20M=40M** |
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| 14 | A typical ECG has three almost immediately distinguishable waves or deflections. With the help of neat typical ECG waveforms explain the electrical activity of the Heart. Explain Einthoven triangle and describe how ECG lead configurations are employed. In a certain measurement of ECG using bipolar electrodes, the following potentials were observed. Find the lead voltages developed. Verify Einthoven's Law. * + 1. The right arm = -0.2 mV
		2. The left arm = 0.3 mV
		3. The left leg = 1 mV
 | (C.O.No. 3)  |  [Application]  |
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| 15 | a.Sketch a neat diagram and equivalent circuit of a Variable Area Parallel Plate capacitance pressure transducer and briefly explain its operation to illustrate that the Sensitivity of the transducer is the change in the capacitance to the change in length (displacement) b. A certain thermistor has a $10 kΩ$ resistance at 25°C and $4 kΩ$ resistance at $100^{0}C$. Find the value of $β$.  | (C.O.No. 1)  | [Application]  |
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| 16 | A therapeutic device is an instrument or apparatus used to diagnose, prevent, and treat diseases or impairments. By giving external electrical stimulation impulses to the heart muscles, it is possible to regulate the heart rate. Describe how this can be achieved by using Ventricular synchronous demand pacemaker with a neat block diagram. | (C.O.No.4)  | [Comprehension]  |
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