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

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**End Semester Examination – Nov/Dec – 2018**

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| **Code :** | **15EI2005** | **Duration :** | **3hrs** |
| **Sub. Name :** | **BIOSIGNAL CONDITIONING CIRCUITS** | **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. | Design an op amp circuit to implement this equation V0 = V1 . | CO1 | 4 |
| b. | The use of differential amplifiers is common in bio potential measurements. Justify the statement. | CO3 | 8 |
| c. | For the op – amp configuration shown in figure, determine the Rf if the gain required is 61. Elaborate the design steps of the given amplifier and analyse the circuit with and without Compensation. | CO2 | 8 |
| (OR) | | | | |
| 2. | a. | A scope detects a biosignal and a noise signal from the same electrode. Design and construct a subtractor using op amp for this application. | CO1 | 14 |
| b. | Comment on bio electrodes and electrode skin interference. | CO3 | 6 |
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| 3. | a. | Explain the types of bio signals mostly used for signal conditioning applications. | CO2 | 4 |
| b. | The short-lasting event in which the electrical membrane potential of a cell rapidly rises and falls. Comprehend the event. | CO2 | 4 |
| c | Design and create an adder circuit using op-amp to add three input voltages V1, V2 and V3. | CO3 | 12 |
| (OR) | | | | |  | The short-lasting event in which the electrical membrane potential of a cell rapidly rises and falls. Comprehend the event. |
| 4. | a. | Explain the characteristics of an ideal op amp and its significance. | CO1 | 6 |
| b. | Mention the significance of bio electric currents and its measurement. | CO3 | 8 |
| c | Calculate the input bias current of the op amp for bias currents IB1 and IB2 as 400nA and 300nA. Analyse the performance of amplifier with input bias current. | CO1 | 6 |
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| 5. | a. | Comment on applications of filters in medical instrumentation. | CO1 | 5 |
| b. | Design a practical differentiator for a cut of frequency of 3kHz. | CO2 | 10 |
| c. | Design a notch filter for an upper and lower cut off frequency of 2kHz and 3kHz respectively. | CO2 | 5 |
| (OR) | | | | |
| 6. |  | Design and construct a pacemaker circuit that will give pulses on demand. | CO3 | 20 |
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| 7. | a. | Analyse the significance of digitizing in medical application. | CO3 | 6 |
|  | b. | What are the various digital interfaces used? | CO2 | 6 |
|  | c. | Suggest suitable digital interfaces used for various biomedical applications like MRI, EEG, CT etc. Explain each in detail. | CO1 | 8 |
| (OR) | | | | |
| 8. | a. | Design a Voltage controlled oscillator to generate square wave and triangular wave of frequency 12 kHz. | CO2 | 10 |
|  | b. | Briefly explain PLL and its biomedical applications. | CO2 | 10 |
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|  | | **Compulsory**: |  |  |
| 9. |  | Discuss in detail about the medical isolation amplifiers. | CO2 | 20 |