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



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

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| **Code :** | **17BM2005** | **Duration :** | **3hrs** |
| **Sub. Name :** | **BIO SIGNAL CONDITIONING CIRCUITS** | **Max. Marks :** | **100** |

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | Explain various stages of basic op-amp. | CO2 | 10 |
| b. | Summarize A.C characteristics of ideal op-amp. | CO2 | 10 |
| **(OR)** | | | | |
| 2. | a. | Analyse an ideal non-inverting amplifier and obtain an expression for its gain. | CO3 | 10 |
| b. | Justify the use of differential amplifiers in bio potential measurements. |  | 4 |
| c. | Design an adder –subtrator circuit for V0=2V1+5V2-10V3 . | CO3 | 6 |
|  |  |  |  |  |
| 3. | a. | Design a circuit to acquire an ECG signal less than 20 Hz and obtain its frequency response characteristics having -20dB/decade. | CO4 | 10 |
| b. | Analyse the various design steps in torroidally coupled medical isolation amplifier. | CO4 | 10 |
| **(OR)** | | | | |
| 4. | a. | Draw the instrumentation amplifier using 3 op-amps and derive the expression for the overall gain. | CO4 | 10 |
| b. | Comment on optical mode of isolation in bio measurement. | CO4 | 10 |
|  |  |  |  |  |
| 5. | a. | Discuss the working of comparator using op-amp and mention its applications. | CO5 | 10 |
| b. | An IC 555 chip has been used to construct a pulse generator. Typical pin connections with components are shown below. It is desired to generate a square pulse of 10 kHz.  Evaluate values of RA and RB  if the capacitor C has the value of 0.01 µF for the configuration chosen. If necessary, you can suggest modification in the external configuration. | CO5 | 10 |
| **(OR)** | | | | |
| 6. | a. | Design and explain embedded based ECG signal interface to analyse heart rate. | CO6 | 10 |
| b. | Design a 4bit R-2R ladder network. Determine the size of each step if R=10KΩ, Rf=20KΩ and Vcc=±15V. Calculate the output voltage for D0=1, D1=0, D2=1 and D3=1 if bit ‘1’ is applied as 5V and bit ‘0’ applied as 0V. | CO6 | 10 |
|  |  |  |  |  |
| 7. | a. | Compare and contrast properties of various bioelectrode. | CO1 | 10 |
| b. | Outline the significance of bio electric currents and its measurement. | CO1 | 10 |
| **(OR)** | | | | |
| 8. | a. | Differentiate between action and nerst potential in detail. | CO1 | 10 |
| b. | Draw the equivalent circuit for electrode and skin interface and explain its importance in medical field. | CO1 | 10 |
|  | | **Compulsory**: |  |  |
| 9. | a. | Discuss in detail about the electrical hazards and the safety measures in biomedical applications. | CO1 | 10 |
| b. | Draw the block diagram of basic Phase Locked Loop and explain its significance in bio telemetry. | CO1 | 10 |