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



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

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| **Code :** | **18BM3002** | **Duration :** | **3hrs** |
| **Sub. Name :** | **ADVANCED MEDICAL SIGNAL PROCESSING** | **Max. marks :** | **100** |

**ANSWER ANY FIVE QUESTIONS (5 x 16 = 80 Marks)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | Find the DFT of the sequence x(n) = { 2, 1, 2, 1, 1, 2, 1, 2} using radix-2 DIT-FFT algorithm. | CO1 | 10 |
| b. | Determine the cross correlation of the sequences, x(n) = {1 , 1, 2, 2} and y(n) ={ 1, 0.5, 1}. | CO1 | 6 |
|  |  |  |  |  |
| 2. | a. | Elaborate on the concept of Event related potentials. | CO2 | 10 |
| b. | Discuss on the objectives and difficulties of biomedical signal analysis. | CO2 | 6 |
|  |  |  |  |  |
| 3. |  | Design a Butterworth digital IIR lowpass filter using bilinear transformation by taking T =0.1 second, to satisfy the following specifications.Draw direct form I structure of the filter. | CO3 | 16 |
|  |  |  |  |  |
| 4. | a. | Discuss the concept of adaptive filter for noise cancellation using LMS algorithm. | CO4 | 8 |
| b. | Illustrate the removal of power line Interference while recording the ECG signal of a patient | CO4 | 8 |
|  |  |  |  |  |
| 5. | a. | Describe the estimation of R-R interval using Finite First Difference Method. | CO5 | 10 |
| b. | With the help of a diagram explain the waves and Intervals of an ECG signal. | CO5 | 6 |
|  |  |  |  |  |
| 6. | a. | Explain about the Wiener Filtering Problem. Also derive the expression for finding the optimal weight vector and estimated error. | CO3 | 12 |
| b. | Write short notes on time domain filtering. | CO3 | 4 |
|  |  |  |  |  |
| 7. |  | Elaborate on the various algorithms for QRS Detection in an ECG signal. | CO5 | 16 |
|  | | | | |
| **COMPULSORY QUESTION (1 x 20 = 20 Marks)** | | | | |
| 8. | a. | Explain the time varying analysis of Heart rate variability. | CO6 | 10 |
| b. | Describe the detection of coronary artery disease by wavelet shrinkage method. | CO6 | 10 |