Name :
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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

07 THRISSUR CLUSTER

THIRD SEMESTER M.TECH. DEGREE EXAMINATION DEC 2017

Electronics & Communication Engineering

Communication Engineering & Signal Processing

07EC6239 BIOMEDICAL SIGNAL PROCESSING

Max. Marks: 60 Duration: 3 Hours

Answer all six questions. Part 'a' of each question is compulsory

Answer either Part 'b' or Part 'c' of each question

Module 1

Q. no.		Marks
1a	Explain briefly the origin of bio potential and its measurements.	4
	Answer b or c	
b	Explain 10-20 lead system in EEG, and describe about the frequency components in the EEG signal.	5
c	With the help of sketch explain 12-lead system in ECG	5

Module 2

Q. no.		Marks
2a	Explain a method to obtain an indicator of atrial contraction to measure the PR Interval.	4
	Answer b or c	
b	A signal $X(t)$ is transmitted through a channel. The received signal $Y(t)$ is a scaled ,shifted and noisy version of $X(t)$ is given as $Y(t)=aX(t-t_o)+n(t)$ where a is a scale factor ,t_o is the time delay, and $n(t)$ is noise. Assume that the noise process has zero mean and is statistically independent of the signal process , and that all process are stationary . derive expressions for the PSD of $Y(t)$ in terms of the PSDs of X and n.	5

c	Explain the properties and effects of noise in biomedical instruments.	**5**

Module 3

Q. no		**Marks**
3a	Propose a time-domain technique to remove random noise given the Possibility of acquiring multiple realizations of the signal or event of interest.	**4**
	Answer b or c	
b	Propose an algorithm to detect QRS complexes in an ongoing ECG signal.	**5**
c	Propose an adaptive noise cancellation filter to remove the maternal ECG to obtain the fetal ECG. Chest-lead ECG signals of the mother may be used for reference.	**5**

Module 4

Q. no		**Marks**
4a	Explain briefly the steps in ECG analysis.	**4**
	Answer b or c	
b	Explain base line wander. Develop a technique to remove it.	**5**
c	Explain a noise filtering technique which removes both power-line interference and base line drift.	**5**

Module 5

Q. no		**Marks**
5a	Explain Heart Rate Variability.	**5**
	Answer b or c	
b	Explain the spectral analysis of heart rate variability.	**7**
c	What are the different rhythms, waves and transients present in EEG signal? Explain in detail.	**7**

Module 6

Q.no		Marks
6a	Explain the linear modelling of EEG.	**5**

Answer b or c

b	What are the artifacts in EEG? Explain its characterises and processing.	**7**
c	Explain the model based spectral analysis of EEG.	**7**