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Code No. : 42321 B

**VASAVI COLLEGE OF ENGINEERING (Autonomous), HYDERABAD**  
**B.E. (ECE) IV Year II-Semester Examinations, May-2019**

**Biomedical Signal Processing**

Time: 3 hours

Max. Marks: 70

*Note: Answer ALL questions in Part-A and any FIVE from Part-B*

Q.No.	Stem of the question	M	L	CO	PO
<b>Part-A (10 × 2 = 20 Marks)</b>					
1.	Define discrete random variable. How do we denote-give one example?	2	1	1	1
2.	List properties of Auto correlation function.	2	2	1	1
3.	Let $f_x(x) = 1/12$ , for $0 \leq x \leq 12$ be a probability function of X continuous sample space. Then find the distribution function $F_x(x)$ and plot the curve.	2	1	1	1
4.	In a given experiment, if a random variable X has the elements $X = \{1, 2, 5\}$ with probabilities $P_x(x) = \{1/9, 3/9, 5/9\}$ . Draw the distribution function of X.	2	2	2	1
5.	Explain the need for data compression. Compare Lossless and Lossy Data Compression.	2	2	3	1
6.	What is the need for estimation of R-R interval in ECG signal?	2	1	3	1
7.	Define Arrhythmia that occurs to the human heart.	2	2	4	1
8.	Illustrate the limitations of Prony's method.	2	2	4	1
9.	Write the basic operations to analyze EEG signals.	2	1	5	1
10.	Sketch the transfer function representation of Auto regressive process.	2	2	5	1
<b>Part-B (5 × 10 = 50 Marks)</b>					
11. a)	Explain the properties of Probability Density function.	4	2	1	1
b)	Derive the equation of Rayleigh probability distribution function from Rayleigh probability density function for a random variable and find the maximum value of Rayleigh probability density function.	6	5	1	2
12. a)	Compare Turning Point (TP) and Amplitude Zone Time Epoch Coding (AZTEC) algorithm of ECG data compression techniques.	2	3	2	2
b)	Explain Coordinate Reduction Time Encoding System (CORTES) data compression technique for ECG wave forms, with a flow chart.	8	3	2	1

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13. a)	Sketch a typical cardiac cycle, identify all the complexes, inter wave segments and cardiac intervals.	4	2	3	1
b)	Describe the template cross correlation method to detect QRS complex waveform of ECG Signal with necessary patterns.	6	2	3	2
14. a)	Why is Prony's method suggested for modeling evoked potentials?	4	3	4	2
b)	Analyze Least Square Prony's method to model evoked potential.	6	4	4	2
15. a)	Illustrate how segmentation of Seizure EEG signal is achieved using Auto Regressive model.	6	2	5	3
b)	Analyze how inverse filtering is used for predicting EEG signal?	4	4	5	2
16. a)	Describe briefly Noise Power Spectral Density and Noise Figure.	5	2	1	1
b)	List the advantages of Discrete Cosine Transform (DCT) compared to other transform techniques.	5	2	2	1
<b>17. Answer any two of the following:</b>					
a)	Explain the principle of adaptive noise cancellation with block diagram.	5	2	4	1
b)	Write Yule-Walker (Y-W) equations and give the important application areas of these equations.	5	2	4	1
c)	Describe the characteristics of EEG in various sleep stages.	5	2	5	1

M: Marks; L: Bloom's Taxonomy Level; CO: Course Outcome; PO: Programme Outcome

S. No.	Criteria for questions	Percentage
1	Fundamental knowledge (Level-1 & 2)	67
2	Knowledge on application and analysis (Level-3 & 4)	27
3	*Critical thinking and ability to design (Level-5 & 6) (*wherever applicable)	6

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