Reg. No.															

Question Paper Code	13264

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2024

Fourth Semester

Artificial Intelligence and Data Science

20AIPC402 - BIOMEDICAL SIGNAL AND IMAGE PROCESSING

Regulations - 2020

Duration: 3 Hours Max. Marks: 100

PART - A (MCQ) (20 × 1 = 20 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	Which of the following is a unit step function? (a) u(t)=t (b) u(t)=1 for t≥0 (c) u(t)=e^t (d) u(t)=δ(t)	1	K1	CO1
2.	Which of the following statements is true for a Aperiodic signal? (a) It repeats at regular intervals. (b) It has a finite duration. (c) It is always real. (d) It does not exhibit periodicity.	1	K1	CO1
3.	If a signal has a finite energy but zero power, it is classified as a: (a) Power signal (b) Energy signal (c) Periodic signal (d) Deterministic signal	1	K1	CO1
4.	Bio-potentials are primarily generated by which of the following? (a) Heat changes in the body (b) Movement of ions across cell membranes (c) Vibration of tissues (d) Oxygen transport in blood	1	K1	CO2
5.	Which electrode type is commonly used for measuring surface biopotentials like ECG? (a) Metal disk electrodes (b) Needle electrodes (c) Capacitive electrodes (d) none	1	K1	CO2
6.	The phonocardiogram (PCG) records sounds associated with (a) Brain activity (b) Heartbeats (c) Muscle contractions (d) Digestive movements	1	K1	CO2
7.	In order to implement sharpening filters in the frequency domain, it is sufficient to know how to implement (a) Low pass filter (b) High pass filter (c) Band pass filter (d) Both a & b	1	K1	CO3
8.	In which of the following domain filtering the low or high emphasis filtering is done? (a) Time domain (b) Frequency domain (c) Both Time and Frequency (d) None	1	K1	CO3
9.	……. is also known as the smoothing filter. (a) Median filter (b) High pass filter (c) Low pass filter (d) Band pass filter	1	K1	CO3
10.	Restoration cannot be done using (a) Single projection (b) Double projection (c) Triple projection (d) Both a & c	1	K1	CO4
11.	Which is not a type of noise? (a) Gamma noise (b) Black noise (c) Exponential noise (d) Rayleigh noise	1	K1	CO4
12.	What is the main purpose of restoration? (a) To gain pixel (b) To gain the original image (c) To gain degraded image (d) To gain the coordinates	1	K1	CO4
13.	Which of the following is the simplest and most common quantizer? (a) Uniform quantizer (b) Zero memory quantizer (c) Both a & b (d) none	1	K1	CO5
14.	The reciprocal of nyquist frequency is called _____. (a) Nyquist rate (b) Nyquist interval (c) Nyquist level (d) none	1	K1	CO5
15.	The overlapping of successive periods of the spectrum is called _____. (a) Aliasing (b) Sampling (c) Over sampling (d) Under sampling	1	K1	CO5
16.	On grayscale,_____ represents white (a) L-1 (b) L-2 (c) L-3 (d) L-4	1	K1	CO5
17.	Which of the following are used to find any brain tumor? (a) ECG (b) EEG (c) Ultrasonography (d) EMG	1	K1	CO6
18.	Ultrasonic diagnostics is based on …… (a) Echo (b) Doppler shift effect (c) X-ray (d) Both a & b	1	K1	CO6

19.	In fluoroscopy, X-rays are converted into a……on a fluorescent screen which can be viewed directly (a) X-ray image (b) Visual image (c) Analog image (d) Digital image.		*1*	*K1*	*CO6*
20.	……is an x-ray of the chest takes an image of the heart, lungs, blood vessels, the airways, and the lymph nodes in this area. (a) Chest X-ray (b) Spinal X-ray (c) Extremity X-ray (d) Both a & c		*1*	*K1*	*CO6*

PART - B (10 × 2 = 20 Marks)

Answer ALL Questions

21.	Distinguish between Continuous and Discrete time signals.		*2*	*K2*	*CO1*
22.	Draw the signal u(t-2)+u(t+3).		*2*	*K2*	*CO1*
23.	Write down the Nernst equation of action potential.		*2*	*K1*	*CO2*
24.	What are perfectly polarized and perfectly non polarized electrodes?		*2*	*K2*	*CO2*
25.	What is meant by image filtering?		*2*	*K1*	*CO3*
26.	Distinguish between smoothing and sharpening filters.		*2*	*K2*	*CO3*
27.	Differentiate enhancement from restoration.		*2*	*K2*	*CO4*
28.	What are the various levels of thresholding in an image?		*2*	*K1*	*CO4*
29.	Write the expression for finding the number of bits required to store a digital image.		*2*	*K1*	*CO5*
30.	What are hard X-rays and soft X-rays?		*2*	*K1*	*CO6*

PART - C (6 × 10 = 60 Marks)

Answer ALL Questions

31.	a)	i) Illustrate the relation between the following signals Unit ramp and Unit step signals.	*5*	*K2*	*CO1*
		ii) Unit step and Unit impulse signals.	*5*	*K2*	*CO1*
		OR			
	b)	i) Calculate the power and energy of the signal $x[n]=\cos(\pi n/4)$.	*5*	*K2*	*CO1*
		ii) Prove that the power of energy signal is zero.	*5*	*K2*	*CO1*
32.	a)	Draw the electrical equivalent circuit of microelectrode and explain its electrical nature.	*10*	*K2*	*CO2*
		OR			
	b)	Explain the origin of different heart sounds.	*10*	*K2*	*CO2*
33.	a)	What are image sharpening filters? Explain the various types of it.	*10*	*K2*	*CO3*
		OR			
	b)	Show the various techniques in frequency domain to enhance an image with necessary examples.	*10*	*K2*	*CO3*
34.	a)	Explain different noise models in image processing.	*10*	*K2*	*CO4*
		OR			
	b)	Describe about edge detection with necessary illustrations and mathematical operators.	*10*	*K2*	*CO4*
35.	a)	Describe image formation in the eye with brightness adaptation and discrimination.	*10*	*K2*	*CO5*
		OR			
	b)	Outline in detail about: i) RGB model, ii) HSI model.	*10*	*K2*	*CO5*
36.	a)	Explain the production of x-rays with detail description of construction of x-ray tubes.	*10*	*K3*	*CO6*
		OR			
	b)	Integrate various different components used in NMR to build a MRI system.	*10*	*K3*	*CO6*