Sixth Sem BME ⑥

Reg.No.:

VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
[AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]
Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

Question Paper Code: 12002
B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – May 2023
Sixth Semester
Biomedical Engineering
U19BM613 – DIAGNOSTIC AND THERAPEUTIC EQUIPMENT - I
(Regulation 2019)

Time: Three Hours   Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 – Evaluating
	K2 – Understanding	K4 – Analyzing	K6 – Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	Mention various lead configuration in ECG Signal acquisition.	2	K1	CO1
2.	Diagrammatically distinguish a normal sinus rhythm with arrhythmia.	2	K3	CO1
3.	Identify the various rhythms present in EEG signal.	2	K2	CO2
4.	List the clinical significance of Evoked potential.	2	K2	CO2
5.	Mention the types of muscle tissues.	2	K2	CO3
6.	List the temporal and spatial parameters that aids in the GAIT analysis.	2	K2	CO3
7.	Define: TV, IRV and ERV.	2	K1	CO4
8.	State the difference between nebulizer and humidifier.	2	K3	CO4
9.	State the significance of Pure tone audiometer.	2	K2	CO5
10.	Identify the clinical applications of polygraph.	2	K2	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.			Questions	Marks	KL	CO
11. a)	i.		Draw the typical block diagram of an ECG recorder and explain in detail.	8	K3	CO1
	ii.		State the significance of AV node. Explain about the origin of electrical activity and conduction mechanism in a heart.	5	K2	CO1

(OR)

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	b)	Identify the instrument which is capable of generating artificial pacing impulses and delivering them to the heart. Describe its features with respect to its applications.	13	K3	CO1
12.	a)	Discuss the necessity for evoked response in a brain function analysis. Elucidate in detail about visual and auditory evoked potential system.	13	K4	CO2

(OR)

	b)	Describe the 10-20 lead system used in EEG and also explain the procedure to record the EEG signal.	13	K3	CO2
13.	a)	Needle electrodes give more precise signal for EMG measurement, but it is not the most common electrode used for EMG, why? Describe in detail about the origin of myoelectric signal and instrumentation for EMG recording.	13	K4	CO3

(OR)

	b)	i. Draw the typical intensity time curve of a normal muscle and degenerated muscle. Indicate and explain the following terms in the curve: chronaxie, rheobase and accommodation.	6	K4	CO3
		ii. Differentiate the characteristic of an EMG signal and an electrical noise and explain the instrumentation for filtering out the noise from the EMG signal	7	K3	CO3
14.	a)	Describe a spirometer and explain how it is used to measure respiratory volumes.	13	K3	CO4

(OR)

	b)	State the basic principles of Pneumotachometer devices and express how the instantaneous rates of volume flow of respired gases is measured using Pneumotachometer.	13	K3	CO4
15.	a)	i. Identify the various types of devices used for Psychophysiological measurements. Describe their significance.	5	K3	CO5
		ii. With a neat sketch explain the mechanism of hearing.	8	K3	CO5

(OR)

	b)	Compare and contrast between the different types of tonometry used in the sensory measurement of eye with necessary illustrations.	13	K4	CO5

PART – C

(1 x 15 = 15Marks)

Q.No.		Questions	Marks	KL	CO
16.	a)	i. Compare and contrast the design aspects of Pad and Needle type electrodes used for recording of EEG and EMG signals. State its advantages and disadvantages.	7	K4	CO2
		ii. Elaborate on the clinical applications of EMG Biofeedback system.	8	K3	CO3

(OR)

	b)	Classify the different types of ventilator. Describe their significance with necessary illustrations.	15	K4	CO4

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Question Paper Code: 12001
B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – May 2023
Sixth Semester
Biomedical Engineering
U19BM612 – MEDICAL IMAGE PROCESSING
(Regulation 2019)

Time: Three Hours   Maximum: 100 Marks
Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 – Evaluating
	K2 – Understanding	K4 – Analyzing	K6 – Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	Define Image Sampling & Quantization.	2	K1	CO1
2.	A 256X256 pixel digital image has eight distinct intensity levels. What is the minimum number of bits required to code this image in a lossless manner?	2	K2	CO1
3.	List out the steps involved in filtering an image in the frequency domain.	2	K2	CO2
4.	State the differences between image restoration and image enhancement.	2	K3	CO2
5.	Give the Robert mask to detect the horizontal and vertical edges in an image.	2	K2	CO3
6.	What type of segmentation is the following mask used for? Why the mask is called isotropic? $$\begin{bmatrix} 1 & 1 & 1 \\ 1 & -8 & 1 \\ 1 & 1 & 1 \end{bmatrix}$$	2	K4	CO3
7.	What are the functions performed by a source encoder and decoder in a general image compression model?	2	K2	CO4
8.	The CT images of the brain and chest were compressed and stored. Later they are decomposed for diagnosis. How will you make an objective assessment of the quality of the decompressed images?	2	K4	CO4
9.	Identify different types of medical image reconstruction methods.	2	K2	CO5
10.	How can image artifacts be minimized during medical image reconstruction?	2	K3	CO5

(5 x 13 = 65 Marks)

Q.No.	Questions	Marks	KL	CO
11. a)	With a neat illustration of the cross section of the human eye, explain the structure and function of the eye.	13	K2	CO1
	(OR)			
b)	Discuss the applications of basic arithmetic and logical operation on images.	13	K2	CO1
12. a)	What is Image Enhancement? Explain one method each for the following techniques: i. Point processing ii. Spatial filtering iii. Frequency domain filtering	13	K2	CO2
	(OR)			
b) i.	Explain gray level transformation used in histogram equalization and show how new gray levels can be estimated with necessary illustrations.	7	K3	CO2
ii.	Compare the characteristics of median and mean filters and identify the situations where you can use them.	6	K3	CO2
13. a)	Compare and contrast between the various types of image segmentation methods.	13	K4	CO3
	(OR)			
b) i.	An image f(x,y) is to be segmented into two partitions as shown below $$g(x,y) = \begin{cases} 1, & f(x,y) > T \\ 0, & f(x,y) < T \end{cases}$$ Where g(x,y) is the segmented image. Write briefly about a method that would generate an optimum vale of the threshold "T" by maximizing the variance between the two partitioned classes.	6	K3	CO3
ii.	A horizontal intensity profile through the center of an image shows a step edge and a line. With appropriate masks, discuss the various techniques available for the edge and line segmentation.	7	K3	CO3
14. a)	Explain how image compression is achieved using Huffman coding and Runlength coding with suitable examples.	13	K3	CO4
	(OR)			
b)	Explain Morphological opening and closing and its applications with suitable example.	13	K3	CO4

15.	a)	i.	Discuss the advantages and disadvantages of analytical and iterative image reconstruction methods in nuclear medicine.	7	K3	CO5
		ii.	How does the choice of reconstruction algorithm affect the quality of the final image?	6	K3	CO5

(OR)

	b)	Outline the difference between filtered back projection and iterative reconstruction in CT image reconstruction.	13	K3	CO5

PART – C

(1 x 15 = 15Marks)

Q.No.		Questions	Marks	KL	CO
16.	a)	Elaborate on the applications of spatial and frequency domain filtering in medical image processing.	15	K4	CO2

(OR)

	b)	Explain, how intensity changes in image can be segmented using first and second spatial derivatives of the image with examples and illustrations.	15	K4	CO3

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Time: Three Hours   Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analyzing	K6 - Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	What is the purpose of UNIPROT and Genbank?	2	K2	CO1
2.	Name any two databases to retrieve DNA/RNA.	2	K1	CO1
3.	Differentiate between FASTA and FASTAQ file formats.	2	K2	CO2
4.	Define organism-specific databases with an example.	2	K1	CO2
5.	Indicate the use of scoring matrices in sequence alignment.	2	K2	CO2
6.	Mention the uses of EntreZ.	2	K2	CO1
7.	Calculate the maximum similarity score upon global alignment between the two strings S1 = ATGGCT and S2 = ACGGCA, considering the following scoring parameters: +1 for match, −1 for mismatch, and −1 for a gap.	2	K3	CO4
8.	Distinguish between Global and local sequence alignment.	2	K2	CO3
9.	Infer the need for comparative genomics study.	2	K2	CO1
10.	Name any two tools used in phylogenetic analysis.	2	K1	CO3

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PART – B

Q.No.		Questions	Marks	KL	CO
11.	a)	Classify and elaborate the different types of biological databases.	13	K1	CO1
		(OR)			
	b)	Explain the importance of biological databases in bioinformatics.	13	K2	CO1
12.	a)	What are CATH and SCOP? Explain their importance in bioinformatics.	13	K2	CO3
		(OR)			
	b)	What is indexing? Write a detailed note on indexing attributes and types of indexing.	13	K1	CO2
13.	a)	Summarize the applications of DBGET and SRS in bioinformatics.	13	K2	CO5
		(OR)			
	b)	Discuss in detail the use of distance matrices in biology.	13	K2	CO4
14.	a)	Describe PSI-BLAST in detail.	13	K2	CO4
		(OR)			
	b)	Demonstrate Needleman and Wunsch algorithm using suitable examples.	13	K2	CO5
15.	a)	Predict the role of ANN in protein structure prediction and explain in detail.	13	K1	CO5
		(OR)			
	b)	Compare and contrast parsimony Distance, and Likelihood-based algorithms.	13	K2	CO4

PART – C

Q.No.		Questions	Marks	KL	CO
16.	a)	Construct a phylogenetic tree for the given data using UPGMA. From the tree, calculate the shortest distance and branch length.	15	K6	CO4

	A	B	C	D	E	F
A	0					
B	16	0				
C	19	25	0			
D	36	15	21	0		
E	23	33	12	39	0	
F	9	30	35	27	42	0

(OR)

	b)	Classify the different approaches used in multiple sequence alignment and elaborate each.	15	K2	CO3

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Question Paper Code: 7017
B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – May 2023
Sixth Semester
Biomedical Engineering
U19EC519 – MICROPROCESSOR AND MICROCONTROLLER
(Regulation 2019)
(Common to Electronics and Communication Engineering - Fifth Semester)

Time: Three Hours   Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analyzing	K6 - Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	Draw the flag register format of 8085 and define the function of each flag.	2	K1	CO1
2.	List the segment registers and their default offset address registers in the 8086.	2	K1	CO1
3.	What is the function of $\overline{s0}$, $\overline{s1}$ and $\overline{s2}$ status signals in 8086?	2	K2	CO2
4.	Draw the memory bank decoding logic in 8086.	2	K2	CO2
5.	Write the BSR mode to set and reset PC5 in 8255.	2	K3	CO3
6.	Is it possible to transfer the data from I/O devices to the memory without the intervention of CPU? Justify your answer.	2	K2	CO3
7.	List the interrupts available in 8051 microcontroller.	2	K2	CO4
8.	Write the on-chip memory structure of 8051 microcontroller.	2	K2	CO4
9.	Write an assembly program to generate a square wave of 10KHz on P1.0 using a timer0, assuming that the clock frequency of the 8051 is 12MHz.	2	K3	CO5
10.	Draw a schematic to interface common cathode 4-digit multiplexed seven segment display with the 8051 microcontroller.	2	K3	CO5

Q.No.		Questions	Marks	KL	CO
11.	a)	Explain the function of each and every control signal of timing and control unit of 8085 with read and write cycle timing diagrams.	13	K2	CO1
		(OR)			
	b)	Discuss the architectural features of 8086 with neat block diagram and explain the significance of memory segmentation.	13	K2	CO1
12.	a)	Draw the 8086 based system block diagram and explain the function of control/status signals used for different modes of operation of 8086.	13	K2	CO2
		(OR)			
	b)	Discuss the different configurations of 8086 based multiprocessor system with proper diagrams.	13	K2	CO2
13.	a)	Draw the schematic diagram and memory map table to interface four 8KB RAM chips (6264) with the 8086 and assign the address range 80000H-87FFFH.	13	K3	CO3
		(OR)			
	b)	Draw the block diagram of programmable timer counter (8253) and discuss its operating modes with timing diagrams.	13	K2	CO3
14.	a)	Explain the 8051 ports pin configuration and on-chip features of the 8051-micro controller with neat block diagram.	13	K2	CO4
		(OR)			
	b)	Write an assembly language program in 8051 to find the sum of an array of BCD numbers at the internal memory locations 70H-7FH. Assume that sum is a 16-bit number. Store the sum in the external memory locations 9100H and 9101H.	13	K4	CO4
15.	a)	Write an assembly language program to transmit and receive an ASCII character 'A' continuously using 8051 serial port. Use 8-bit data at 9600 baud with no parity and use Polled operation.	13	K4	CO5
		(OR)			
	b)	Write a program to generate ramp waveform 0 to 5V and staircase waveform of 2V and 4V step size by interfacing DAC0800 chip with 8051.	13	K4	CO5

PART – C

Q.No.	Questions	Marks	KL	CO
16. a)	Draw the interfacing logic and write an assembly language program for the following application. Read the temperature (LM 35 sensor) data using ADC 0804 and display it on LCD 16x2 with 8051 microcontroller and also compare it with the threshold value of 50 Centigrade. Trigger the buzzer if it exceeds the threshold otherwise monitor the temperature continuously.	15	K4	CO5

(OR)

b)	Interface 4x4 keypad and stepper motor with the 8051 microcontroller and write a program to read the rotation angle (0 to 360 degrees) and direction of rotation from the Keypad (A: clock wise rotation and F: anti clock wise rotation) and control the stepper motor desired direction and rotation angle.	15	K4	CO5

Time: Three Hours   Maximum: 100 Marks
Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analyzing	K6 - Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	Can a current of 100 μA & 60 Hz cause cardiac fibrillation? State the reason.	2	K4	CO1
2.	What is the wavelength range of visibility of human eye? Is Ultraviolet range visible or not?	2	K2	CO1
3.	List the different types of senses.	2	K1	CO2
4.	What is olfaction? Give its threshold of measurement.	2	K3	CO2
5.	What is meant by half life Period?	2	K5	CO3
6.	What is the advantage of diagnosing with Radioisotopes?	2	K4	CO3
7.	Define: Compton scattering.	2	K5	CO4
8.	State the use of a Geiger Muller counter.	2	K4	CO4
9.	Define: Gamma ray spectrometry.	2	K5	CO5
10.	Give the applications of radiation detectors in healthcare.	2	K3	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.			Questions	Marks	KL	CO
11.	a)	i.	Write about the Debye model of relaxation process.	6	K3	
		ii.	Write about the leakage current, its viable hazards and mention the precautions if any.	7	K4	CO1

(OR)

	b)	i.	Present a comprehensive analysis of the effects of non-ionizing low frequency radiations.	9	K2	CO1
		ii.	If a human touches both the terminals of a constant 240 V source, can it cause cardiac Fibrillation? Support your argument with human physiological resistivity values.	4	K4	
12.	a)	i.	Draw the components of middle ear.	6	K2	CO2
		ii.	Give a note of loudness versus intensity in hearing.	7		

(OR)

	b)	i.	Write about the mechanism of photoreceptors during scotopic and photopic visions.	8	K1 K2	CO2
		ii.	Explain the physics of cutaneous sensation and its characteristics in detail.	5	K5	
13.	a)		What is radionuclide generator? Explain radionuclide Generator and Technetium generator.	13	K2	CO3

(OR)

	b)		What is radioactive decay? Explain alpha, beta and gamma decay with suitable examples.	13	K3	CO3
14.	a)		Vividly discuss about the processes Photo-electric absorption, Compton effect and pair production with appropriate diagrams wherever necessary.	13	K1 K2	CO4

(OR)

	b)		Write in detail about the interaction of neutron with matter and their clinical significance.	13	K2 K3	CO4
15.	a)		Discuss the working and applications of Solid & liquid scintillation counters.	13	K2 K3	CO5

(OR)

	b)		Describe the operational principle of a gamma camera using a neat block diagram.	13	K3	CO5

PART – C

(1 x 15 = 15Marks)

Q.No.		Questions	Marks	KL	CO
16.	a)	Explain in detail about the methods, principles involved and standards followed in measuring Human's audition, vision and psychophysics levels.	15	K3 K4	CO2

(OR)

	b)	Take a case study of an anonymous patient (irrespective of identity) with some diagnosed and undiagnosed disease of choice. How can a proper diagnostics can be made with your knowledge of diagnostic tools of your choice and detecting degree of infection/illness for a thorough detection. (Limit yourself with any 2 diseases and X-ray and Gamma ray diagnostic methods).	15	K3 K6	CO4

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Question Paper Code: 12006
B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – May 2023
Fourth Semester
Biomedical Engineering
U19BM407 – PATHOLOGY AND MICROBIOLOGY
(Regulation 2019)

Time: Three Hours   Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels	K1 – Remembering	K3 – Applying	K5 - Evaluating
(KL)	K2 – Understanding	K4 – Analyzing	K6 - Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	Define cell injury and Give its types.	2	K1	CO1
2.	Differentiate between apoptosis and necrosis.	2	K2	CO1
3.	Define the terms: edema and hyperemia.	2	K1	CO4
4.	Write about Lymphoma.	2	K1	CO4
5.	Differentiate between endogenous and exogenous infection.	2	K2	CO3
6.	Name any one disease caused by the following organisms: Bacteria, Protozoa, and Helminths.	2	K2	CO3
7.	Describe the principle of dark field microscope.	2	K1	CO2
8.	What is meant by gram staining?	2	K2	CO2
9.	Explain cell mediated tissue injury.	2	K1	CO5
10.	What is meant by antibody and Give its types.	2	K1	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.	Questions	Marks	KL	CO
11. a) i.	Explain in detail about Neoplasia and its classification.	8	K1	
				CO1
ii.	Describe the process of Fracture healing.	5	K2	

(OR)

				Marks	KL	CO
	b)	i.	Describe pathological calcification and its types.	8	K3	CO1
		ii.	How calcifications are involved in the pathogenesis.	5		
12.	a)		Give a detailed description of any two hematological disorders with mechanisms.	13	K2	CO4

(OR)

				Marks	KL	CO
	b)		Discuss on disseminated intravascular coagulation, infraction, shock, and chronic venous congestion.	13	K1	CO4
13.	a)		Give a detailed description of the Growth curve of bacteria with a schematic diagram.	13	K2	CO3

(OR)

				Marks	KL	CO
	b)	i.	Write in detail about the structure of the virus.	8	K2	CO3
		ii.	List any five important diseases caused by viruses.	5	K1	
14.	a)	i.	Describe in detail about an Electron microscope with its constructional details.	5	K1	CO2
		ii.	Explain the key differences between TEM and SEM with a diagram.	8	K3	

(OR)

				Marks	KL	CO
	b)	i.	Explain staining methods used to identify the pathogen E. coli	8	K5	CO2
		ii.	Differentiate phase contrast and fluorescence microscope.	5	K2	
15.	a)	i.	Differentiate between natural and artificial immunity.	6	K3	CO5
		ii.	Discuss the types of Hypersensitivity reactions involved in anaphylactic shock.	7	K4	

(OR)

				Marks	KL	CO
	b)		Describe in detail about autoimmune disorders, their basic concepts, and their classifications.	13	K3	CO5

PART – C

(1 x 15 = 15Marks)

Q.No.			Questions	Marks	KL	CO
16.	a)	i.	A patient's lung is infected with a respiratory virus. How do you diagnose using microscopy and immunological techniques?	8	K5	CO3
		ii.	Describe the involvement of immunity upon a virus infection.	7	K4	

(OR)

Q.No.			Questions	Marks	KL	CO
	b)	i.	A patient is diagnosed with a tumor in the lung. How do you classify the type of tumor using histopathological techniques?	8	K5	CO4
		ii.	Describe immunological methods to diagnose the tumor in the lung.	7	K4	

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Question Paper Code: 7014

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – May 2023
Fourth Semester

Biomedical Engineering

U19EC419 – SIGNALS AND SYSTEMS

(Regulation 2019)

Time: Three Hours   Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analyzing	K6 - Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	Define unit step and unit impulse signals.	2	K1	CO1
2.	Define power and energy signals.	2	K1	CO1
3.	State the convolution property of the Fourier transform.	2	K2	CO2
4.	Write the conditions of Dirichlet's conditions of the Fourier series.	2	K2	CO2
5.	What is the condition of the LTI system to be stable?	2	K3	CO3
6.	Realize the block diagram representing the system $H(s) = \frac{s}{s+1}$.	2	K3	CO3
7.	State the need for sampling.	2	K1	CO4
8.	Write the conditions for the existence of DTFT.	2	K2	CO4
9.	Convolve the following signals: x(n)={1, 1, 3}, h(n) = {1, 4, -1}	2	K2	CO5
10.	What is the difference between recursive and non-recursive systems?	2	K2	CO5

PART – B

Q.No.		Questions	Marks	KL	CO
11.	a)	i. Identify whether the following system is linear or not.	7	K3	CO1
		$$\frac{dy}{dt} + 3t\,y(t) = t^2 x(t)$$			
		ii. Find out the odd and even components of the following signal	6	K3	
		$$x(t) = cost + sint + cost\,sint$$			
		(OR)			
	b)	i. Find out whether the following signal is an energy or power signal.	7	K3	CO1
		$$x[n] = \left(\frac{1}{2}\right)^n u(n) \text{ and } x(t) = u(t) - u(t-5).$$			
		ii. Find out the fundamental time period of the following signal:	6	K4	
		$$y(t) = 20\cos(10\pi + \tfrac{\pi}{6}) \text{ and } x[n] = 2\cos\left(\tfrac{\pi n}{4}\right)\sin\left(\tfrac{\pi n}{8}\right) - 2\cos(\tfrac{\pi n}{2} + \tfrac{\pi}{6})$$			
12.	a)	i. Solve the inverse Laplace transform of $X(s) = \frac{s+3}{(s+1)(s+2)^2}$	7	K3	CO2
		ii. Describe the Fourier transform of a rectangular pulse. Sketch the signal.	6	K3	
		(OR)			
	b)	i. Write the properties of the continuous-time Fourier transform.	7	K2	CO2
		ii. Test the initial and final value of the signal	6	K3	
		$$x(t) = sin4t\ u(t).$$			
13.	a)	Find out the convolution of the following signal:	13	K3	CO3
		$$x(t) = e^{-3t}u(t) \text{ and } h(t) = u(t-1)$$			
		(OR)			
	b)	i. Derive the transfer function of the system for the impulse response: $h(t) = \partial(t) + e^{-3t}u(t) + 2e^{-t}u(t).$	9	K3	CO3
		ii. Write down the equation to find out the convolution integral.	4		
14.	a)	Prove the sampling theorem and explain how the original signal can be reconstructed from the sampled version.	13	K2	CO4
		(OR)			
	b)	Find out the Z-transform of $x(n) = sin(\omega_0 n)u(n)$. Also, specify its ROC.	13	K3	CO4
15.	a)	Estimate the forced response of the system described by the difference equation $y(n) - 1.2y(n-1) + 0.5y(n-2) = x(n)$ for an input signal $x(n) = 3^n u(n)$. Assume the initial conditions are zero.	13	K4	CO5

b) Using the unilateral Z-transform, solve the difference equation: 13 K2 CO5
Y[n]−4y[n−1]+4y[n−2]=x[n]−x[n−1], when y(−1) = y(−2) = 0.

PART – C

(1 x 15 = 15Marks)

Q.No.	Questions	Marks	KL	CO
16. a)	Formulate the trigonometric Fourier series over the interval (-1, 1) for the signal$x(t) = t^2$.	15	K3	CO2

(OR)

b) i. Determine the direct form-II structure of the system given by, 10 K2 CO2

$$y(n) = \frac{1}{2}y(n-1) - \frac{1}{4}y(n-2) + x(n) + x(n-1).$$

ii. Determine the DTFT of $\left(\frac{1}{2}\right)^n u(n)$.   5

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