Total No. of Questions: 23

Enrollment No : _____

MEDICAPS UNIVERSITY

Faculty of Engineering

End Semester Examination May 2025

EE3CO70 Signals & Systems

Programme	:	B.Tech.	**Branch/Specialisation**	:	EE
Duration	:	3 hours	**Maximum Marks**	:	60

Note: *All questions are compulsory. Internal choices, if any, are indicated. Assume suitable data if necessary. Notations and symbols have their usual meaning.*

Section 1 (Answer all question(s))

		Marks	CO	BL
Q1.	The energy of the following signal would be- $x(n) = 2\delta[n] + 5\delta[n-3]$ ○ 9 ○ 20 ○ 49 ◉ 29	1	1	2
Q2.	A signal is an energy signal if- ○ E =0, P =0 ◉ E = Finite, P = 0 ○ E = ∞, P = finite ○ E = Finite, P = ∞	1	1	1
Q3.	The Fourier transform of a unit impulse function δ(t) is- ○ 0 ◉ 1 ○ Infinity ○ None of these	1	2	1
Q4.	Trigonometric Fourier Series representation of an odd function consists of- ○ Cosine terms only ◉ Sine terms only ○ Both Cosine & Sine terms ○ None of these	1	2	2
Q5.	Fourier transform is applicable to- ○ Only periodic signals ◉ Only aperiodic signals ○ Periodic & aperiodic signals ○ Only random signals	1	1	1
Q6.	A discrete system which has a unique relation between its input and output is called- ○ Linear system ○ Time variant system ○ Stable system ◉ Invertible system	1	2	2
Q7.	z-Transform of the unit step sequence u[n] is- ○ z ○ 1/(1-z) ◉ z/(z-1) ○ 0	1	2	3
Q8.	Region of convergence (ROC) of Z-Transform of sequence $x[n] = a^n u[n]$ is- ○ |z| < a ◉ |z| > a ○ |z| = a ○ Entire z-plane	1	5	4
Q9.	What happens if a signal is sampled at a rate lower than the Nyquist rate? ○ The signal is perfectly reconstructed ○ The signal remains unchanged ◉ Aliasing occurs, leading to distortion in reconstruction ○ The sampling rate does not affect signal reconstruction	1	4	4

Q10. Which of the following methods is used for signal reconstruction from its samples? **1 2 2**

- (●) Low-pass filtering
- ( ) High-pass filtering
- ( ) Band-pass filtering
- ( ) Differentiation

Section 2 (Answer all question(s))

Marks CO BL

Q11. How are signals classified? **2 1 1**

Rubric	Marks
At least two signal classifications (one mark for each)	2

Q12. Distinguish between energy and power signals. **3 1 2**

Rubric	Marks
Distinguish between energy and Power Signals on three points (one mark for each point)	3

Q13. (a) Define the unit step, unit impulse and unit ramp signals using definition, graphical representation, and mathematical relationships. **5 1 2**

Rubric	Marks
a) Unit Step	1
b) Unit Impulse	2
c) Unit Ramp	2

(OR)

(b) Illustrate the time shifting and time scaling properties of signals in detail using examples.

Rubric	Marks
a) Time Shifting	2.5
b) Time Scaling	2.5

Section 3 (Answer all question(s))

Marks CO BL

Q14. Discuss the properties of continuous time system. **2 3 2**

Rubric	Marks
Properties	2

Q15. Describe the time-shifting property of the Laplace Transform and explain with a suitable example. **3 4 2**

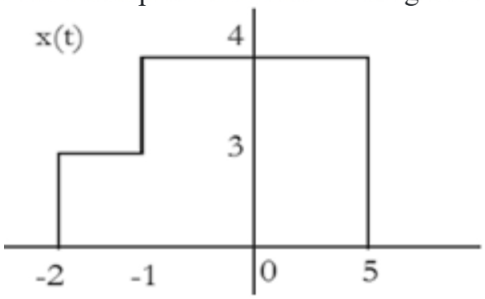
Rubric	Marks
Time-shifting property 1 mark Suitable example 2 marks	3

Q16. (a) Compute the Laplace Transform of the signal x(t)=t2e-2tu(t). Show all steps involved in solving the transform. **5 4 3**

Rubric	Marks
Laplace Transform of the signal 3 marks Show all steps 2 marks	5

(OR)

(b) Find the Laplace transform of the given waveform.



Rubric	Marks
Mathematical expression for this waveform. 2 marks Laplace transformation. 3 marks	5

Section 4 (Answer all question(s))

Marks CO BL

Q17. Write and explain two properties of convolution sum. **3 2 2**

Rubric	Marks
One mark for each property	3

Q18. (a) State the various properties of Fourier Transform. Explain any three in details. **7 3 3**

Rubric	Marks
State the various properties of Fourier Transform.	3
Explain any three in details.	4

(OR)

(b) Consider two discrete sequences as given below

$x[n] = \{1, 2, 4\}$

$h[n] = \{1, 1, 1, 1, 1\}$

Obtain the convolution

$y[n] = x[n] * h[n]$

Rubric	Marks
steps marking	5
Final Answers	2

Section 5 (Answer all question(s))

Marks CO BL

Q19. Find the Z-Transform of the given sequence **4 3 3**

$$x[n] = \{1, \underset{\uparrow}{2}, 2, 1\}$$
$$n = 0$$

Rubric	Marks
Z-Transform of the given sequence	4

Q20. (a) Determine the Z-Transform of the sequence **6 3 3**
$x[n] = (1/2)^n u[n] + (-1/3)^n u[n]$

Rubric	Marks
Steps marking	5
Final Answer	1

(OR)

(b) Illustrate the linearity, time shifting and time reversal properties of Z-Transform in detail with examples.

Rubric	Marks
(a) Linearity	2
(b) Time Shifting	2
(c) Time Reversal	2

Section 6 (Answer any 2 question(s))

Marks CO BL

Q21. What is the Nyquist rate, and why is it important? **5 5 3**

Rubric	Marks
What is the Nyquist rate	3
why Nyquist rate is important?	2

Q22. Discuss the sampling process and explain its significance in signal processing. **5 5 4**

Rubric	Marks
Discuss the sampling process.	3
sampling process significance in signal processing.	2

Q23. Illustrate the process of signal reconstruction from its samples in detail with an example. **5 5 3**

Rubric	Marks
Illustrate the process of signal reconstruction from its samples	3
process of signal reconstruction example.	2

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