

**DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/
MANAGEMENT/COMMERCIAL PRACTICE, APRIL - 2024**

SIGNALS AND SYSTEMS

[Maximum Marks:75]

[Time: 3 Hours]

PART - A

I. Answer all the following questions in one word or one sentence. Each question carries 'one' marks.

(9 x 1 = 9 Marks)

Module Outcome Cognitive level

1	What is the Laplace transform of unit step signal?	M4.01	R
2	ROC of $e^{2t}u(t)$ is	M4.02	R
3	The output of the system when the input is an unit impulse function is	M2.03	U
4	Define signals.	M1.01	R
5	For a static system, the output depends only on the values of input.	M2.04	R
6	The Fourier transform of $\delta(t)$ is	M3.04	R
7	The Nyquist rate for a band limited signal with maximum frequency ' f_m ' is	M3.03	R
8	A system is said to be stable if every input produces a.....output.	M2.04	R
9	The discrete time Fourier series exists only for periodic discrete time signal. (TRUE/FALSE)	M3.01	R

PART - B

II. Answer any eight questions from the following. Each question carries 'Three' marks.

(8 x 3 = 24 Marks)

Module Outcome Cognitive level

1	Define deterministic and random signals.	M1.03	R
2	State Sampling theorem.	M3.03	R
3	Check whether the given system is causal or not. $y(t) = x(2t)$	M2.04	A
4	State the conditions to be satisfied for the existence of Fourier series.	M3.01	R

5	Determine the initial value of the signal $x(t)$ with Laplace transform $X(s) = \frac{7s+6}{s(3s+5)}$	M4.03	U
6	State the time shifting and linearity property of Fourier transform.	M3.03	R
7	Find the DTFT of the signal $x(n) = \{1,2,3\}$. (origin is located at first element of the sequence $x(n)$)	M3.01	A
8	With the help examples, define stable and unstable system.	M2.04	R
9	State the forward and inverse transform equations of Discrete Time Fourier Transform.	M3.01	R
10	Find the inverse system of following signals a) $y(t) = \log x(t)$ b) $y(t) = \sqrt{x(t)}$	M2.04	A

PART - C

Answer all the questions from the following. Each question carries 'seven' marks.

(6 x 7 = 42 Marks)

Module Outcome Cognitive level

III.	With the help of diagram and equation, describe the given signals. a) unit step function (1 Mark) b) unit impulse function (2 Marks) c) unit ramp function (2 Marks) d) signum function (2 Marks)	M1.02	U
	OR		
IV.	Check whether the following signals are periodic or not. If periodic, Determine the fundamental period. a) $\cos(6\pi/t)$ (1 Mark) b) $\sin(6\pi t)$ (2 Marks) c) $\cos 12t$ (2 Marks) d) $\sin(3\pi t) + \cos(4\pi t)$ (2 Marks)		
V.	The signal $x(t)$ is given below: Draw a) $x(-t)$ (1 Mark) b) $x(2t)$ (2 Marks) c) $x(t-2)$ (2 Marks) d) $3x(t)$ (2 Marks)	M1.04	U

	OR		
VI.	Draw the following signals a) $\text{rect}(t/4) + \text{rect}(t/2)$ (3 Marks) b) $e^{3t}u(t)$ (2 Marks) c) $e^{-2t}u(t)$ (2 Marks)	M1.04	U
VII.	Check whether the following systems are linear or not. a) $y(t) = x^2(t)$ (2 Marks) b) $y(t) = tx(t)$ (2 Marks) c) $y(t) = \sin x(t)$ (3 Marks)	M2.04	U
VIII.	OR		
	Check whether the following systems are time invariant or not. a) $y(t) = x(t)$ (2 Marks) b) $y(t) = tx(t)$ (2 Marks) c) $y(t) = x(2t)$ (3 Marks)	M2.04	A
IX.	Find the Fourier transform of the signals $x(t) = e^{-5t}u(t)$	M3.04	A
	OR		
X.	Explain any four properties of F.S.	M3.02	U
XI.	Find the Laplace transform of following signals. a) $x(t) = e^{3t}u(t)$ (2 Marks) b) $x(t) = e^{-2t}u(t)$ (2 Marks) c) $x(t) = e^{3t}u(t) + e^{-2t}u(t)$ (3 Marks)	M4.01	U
	OR		
XII.	Find the inverse Laplace transform of the following transform. a) $X(s) = \frac{1}{s} + \frac{1}{s+2}$ (3 marks) b) $X(s) = \frac{1}{(s-2)} + \frac{1}{(s+3)}$ (4 marks)	M4.04	A
XIII.	Find the Laplace transform of a) Unit impulse function (1 Mark) b) Unit ramp function (3 Marks) c) Unit parabolic function (3 Marks)	M4.01	U
	OR		
XIV.	Find the Inverse Laplace transform for the causal signal given below $X(s) = \frac{2}{s^2+4} + \frac{s}{s^2+9} + \frac{1}{s-2}$	M4.04	U

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