TED (21) - 5201
(REVISION-2021)

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Reg.No……
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DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/ MANAGEMENT/COMMERCIAL PRACTICE, NOVEMBER - 2023

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	Define energy signal.	M1.03	R
2	Outline the graphical representations of continuous–time unit step function u(t).	M1.02	U
3	Define even signal.	M1.03	R
4	Show the mathematical representation of an elementary discrete time signal.	M1.02	U
5	Define causal system.	M2.01	R
6	Show the difference equation representing a discrete-time system.	M2.01	U
7	The spectrum of a discrete-time aperiodic signal is evaluated using ……. (DTFS/DTFT/CTFS/CTFT). Choose one from the bracket.	M3.04	R
8	If the maximum frequency component of a continuous-time signal is f_{max}, what is the Nyquist rate of sampling for the signal?	M3.03	A
9	Find the inverse Laplace transform of $\frac{1}{s-a}$	M4.04	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 causal, anti-causal, and non-causal signals.	M1.03	U
2	State the effect of time scaling on signals.	M1.04	U
3	Show the mathematical and graphical representations of any three elementary continuous time signals.	M1.02	U
4	Differentiate periodic signals and aperiodic signals. Give one example each.	M1.03	U
5	Differentiate discrete-time systems and continuous-time systems.	M2.02	U
6	Define the impulse response of a system. Explain how the causality and the stability of a system are checked from the impulse response of a system.	M2.03	U
7	Identify whether the following systems are invertible or not a) $y(t)=x^2(t)$ b) $y(n) = x(n-2)$	M2.04	A
8	State the conditions for the existence of the Fourier transform.	M3.04	R
9	State and explain the final value theorem of Laplace transforms.	M4.03	R
10	List the properties of ROC of Laplace transform.	M4.02	R

PART – C

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

(6 x 7 = 42 Marks)

		Module Outcome	Cognitive level
III	Classify signals. Give definitions of each type of signal.	M1.03	U
	OR		
IV.	Plot x(n), neatly, whose expression is given below and check whether it is causal, anti-causal, or non-causal. ***x(n)=r(n-2). u(n-3)-r(n-6). u(n-7)*** *(u(n) is discrete time unit step signal, r(n) is discrete time unit ramp signal)*	M1.04	A
V	Check whether the given systems are linear or not. a) $y(t) = x^2(t)$ (3 marks) b) $\frac{dy(t)}{dt} + y(t) = x(t)\frac{dx(t)}{dt}$ (4 marks)	M2.04	A
	OR		
VI	List any 4 properties of a system. Summaries listed properties	M2.04	U

VII	State sampling theorem. Illustrate the effect of aliasing on the spectrum of the sampled signal. **OR**	M3.03	U
VIII	State and illustrate the convolution property of the Fourier Transform.	M3.04	U
IX	Explain the following properties of the Fourier series a) Time scaling (1 marks) b) Time domain convolution (2 marks) c) Frequency shifting (2 marks) d) Time domain differentiation (2 marks) **OR**	M3.01	U
X	Find the Fourier transform of the following signals *a)* $e^{-at}\,u(t)$ (2 marks) b) $\delta(t)$ (2 marks) c) $\text{Cos}(\omega_0 t)$ (3 marks)	M3.04	R
XI	Solve to find the inverse Laplace transform of a) $\frac{s-a}{(s-3)(s-2)}$ (3 marks) b) $\frac{s-a}{(s-a)^2+b^2}$ (2 marks) c) $\frac{1}{s^2+2bs+b^2}$ (2 marks) **OR**	M4.04	A
XII	Write the Laplace transform of the following signals *a)* $cos\ (bt)$ b) $e^{-at}u(t)$ c) $sin\ (bt)$ d) $\delta(t)$ e) r(t) f) p(t) g) u(t) (1 mark each)	M4.01	R
XIII	Explain the following properties of Laplace transform a) Time scaling (1 marks) b) Linearity (2 marks) c) Time shifting (2 marks) d) Initial value theorem (2 marks) **OR**	M4.03	U
XIV	Define ROC of the Laplace transform. Summarize the features of ROC of the transfer function in the cases of stable system and causal systems.	M4.02	U

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