QPC:RJ19BTECH125 AR - 19 Reg. No. | | | | | | | | | | |

GIET UNIVERSITY, GUNUPUR – 765022

B. Tech (Fourth Semester – Regular) Examinations, June – 2021

BPCEC4040 - SIGNALS & SYSTEMS

(ECE)

Time: 2 hrs Maximum: 50 Marks

Answer ALL Questions

The figures in the right hand margin indicate marks.

PART – A: (Multiple Choice Questions) **(1 x 10 = 10 Marks)**

Q.1. Answer ***ALL*** questions [CO#] [PO#]

a. The power in the signal $s(t) = 8\cos(20\pi - \frac{\pi}{2}) + 4\sin(15\,\pi\,t)$ CO1 PO1

(i) 42 (ii) 42

(iii) 40 (iv) 82

b. Which of the following is the even component of the signal $x(t)=e^{(jt)}$? CO1 PO2

(i) sint (ii) j*cost

(iii) j*sint (iv) cost

c. The input and output of a continuous time system are respectively denoted by x(t) and y(t). Which of the following descriptions corresponds to a causal system? CO1 PO1

(i) y(t) = x(n-2) + x(n+4) (ii) y(t) = n x(n+1)

(iii) y(t) = (t+4) x(t-1) (iv) y(t) = (n+5) x(n+5)

d. The trigonometric Fourier series of an even function does not have the CO2 PO1

(i) dc term (ii) sine term

(iii) cosine term (v) harmonic term

e. Let $x[n] = (0.5)^n u[n]$, $y[n] = x^2[n]$ and $Y(e^{jw})$ be the Fourier transform of y[n], then $Y\{e^{j0})$ is CO2 PO2

(i) 1/2 (ii) 2

(iii) 4 (iv) 4/3

f. A 5-point sequence x[n] is given as x[-3] =1, x[-2] = 1, x[-1] = 0, x[0] = 5 and x[1] = 1. Let $X(e^{jw})$ denoted the discrete-time Fourier transform of x[n]. The value of $\int_{-\pi}^{\pi} X(e^{jw})dw$ *is* CO2 PO2

(i) 5 (ii) 10π

(iii) 16π (iv) 5 + j10π

g. The laplace transform of $x(t) = e^{2t}\sin(5t)\,u(t)$ is CO3 PO1

(i) $\frac{5}{s^2 - 4s + 29}$ (ii) $\frac{5}{s^2 + 5}$

(iii) $\frac{s+2}{s^2 - 4s + 29}$ (iv) $\frac{5}{s+5}$

h. An input x(t) = exp (-2t) u(t) + δ(t-6) is applied to an LTI system with impulse response h(t) = u(t). The output is CO3 PO2

(i) [1-exp(-2t)]u(t) + u(t+6) (ii) [1-exp(-2t)] u(t) + u(t-6)

(iii) 0.5[1-exp(-2t)] u(t) + u(t+6) (iv) 0.5 [1-exp(-2t)]u(t) + u(t-6)

i. The ROC of *z* -transform of the discrete time sequence CO4 PO1

$\mathbf{x(n) = \left(\frac{1}{3}\right)^n u(n) - \left(\frac{1}{2}\right)^n u(-n-1)}$ **is**

(i) $|\mathbf{z}| < \frac{\mathbf{1}}{\mathbf{3}}$ (ii) $|\mathbf{z}| > \frac{\mathbf{1}}{\mathbf{2}}$

(iii) $\frac{\mathbf{1}}{\mathbf{3}} < |\mathbf{z}| < \frac{\mathbf{1}}{\mathbf{2}}$ (iv) $2 < |\mathbf{z}| < 3$

j. Consider the z-transform $X(z) = 5z^2 + 4z^{-1} + 3; 0 < |z| < \infty$. The inverse z-transform x[n] is — CO4 PO2

(i) 5 δ[n+2] + 3 δ[n] + 4 δ[n-1] (ii) 5 δ[n-2] + 3 δ[n] + 4 δ[n+1]

(iii) 5 u[n-2] +3 u[n] +4 u[n+1] (iv) 5 u[n+2] + 3 u[n] + 4 u[n-1]

PART – B: (Short Answer Questions) (2 x 5 = 10 Marks)

Q.2. Answer ***ALL*** questions

	Question	[CO#]	[PO#]
a.	Draw the given signal x(n) = u(n) – u(n-2)	CO1	PO2
f.	State Parseval's theorem of DTFT?	CO2	PO1
g.	Solve using Laplace transform of x(t) = u(t) – u(t-5)?	CO3	PO2
i.	What is the Z-transform of the sequence $x(n) = \begin{cases} 1; & 0 < n < 10 \\ 0; & \text{otherwise} \end{cases}$	CO4	PO2
j.	Find the relationship between Z-Transform and DTFT?	CO4	Po1

PART – C: (Long Answer Questions) (6 x 5 = 30 Marks)

Answer ***ANY FIVE*** questions

	Question	Marks	[CO#]	[PO#]
3.	**Identify** whether the following system is linear, time invariant, stable and invertible (1) $y(n) = x^2(n)$ (2) $y(n) = x(n) \cos w_0 n$ (3) y(n) = A x(n) + B	(6)	CO1	PO1
4.	Find the even and odd components of the signal x(t) = cost + sint + cost sint	(6)	CO1	PO1
5.	State DTFT properties of Time Reversal and Differentiation in Frequency domain	(6)	CO2	PO1
6.	Express the Fourier transforms of the following signals in terms of $X(e^{jw})$ $x_1(n) = x(1-n)$ (2) $x_2(n) = (n-1)^2 x(n)$	(6)	CO2	PO1
7.	Find inverse Laplace transform of $\frac{3s^2 + 8s + 23}{(s+3)(s^2 + 2s + 10)}$	(6)	CO3	PO1
8.	Using convolution integral, determine the response of a CT LTI system y(t) given input $x(t) = e^{-at} u(t)$ and impulse response $h(t) = e^{-bt} u(t)$, $\mathbf{|a| < 1, |b| < 1}$	(6)	CO3	PO1
9.	Consider an LTI system with impulse response $h[n] = \alpha^n u[n]$ and the input to this system is $x[n] = \beta^n u(n)$ with $|\alpha|$ & $|\beta| < 1$. (i) Identify the response y[n] when $\alpha \neq \beta$	(6)	CO4	PO2
10.	A discrete time causal system has a transfer function $\mathbf{H(z) = \frac{1 - z^{-1}}{1 - 0.2z^{-1} - 0.15z^{-2}}}$ Draw pole zero diagram and Find the impulse response.	(6)	CO4	PO2

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