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BTECH
(SEM IV) THEORY EXAMINATION 2021-22
SIGNAL SYSTEM

Time: 3 Hours**Total Marks: 100****Note:** Attempt all Sections. If you require any missing data, then choose suitably.**SECTION A****1. Attempt all questions in brief.****2*10 = 20**

Qno	Questions	CO
(a)	Define a signal with example.	1
(b)	Draw the signal $u(n) - u(n-3)$.	1
(c)	Check whether the given system is causal and Time variant $y(t) = t.x(t)$.	1
(d)	State Nyquist theorem.	5
(e)	Determine the sufficient condition for the existence of CTFT.	3
(f)	Find Z-Transform of the signal $x(n) = (1/2)^n . u(n)$ and its ROC.	4
(g)	Determine the fundamental period of the following, if the signal is periodic $x(t) = \cos(\pi t) + \cos(2\pi t)$.	1
(h)	State the expression of Convolution Integral.	2
(i)	Compare CTFT and DTFT.	3
(j)	Find the z transform of $u(n)$.	4

SECTION B**2. Attempt any three of the following:****10*3 = 30**

Qno	Questions	CO
(a)	i) State and prove the frequency shifting theorem of CTFT. ii) Explain the principle of Linearity property corresponding to CTFT.	3
(b)	Consider $x(t) = \text{Cos}(2\pi f_o t)$. Determine it is a power signal or energy signal.	1
(c)	Determine the even and odd components of the following signals i) $x(t) = \cos(t) + \sin(t) + \cos(t) . \sin(t)$ ii) $x(n) = \{ \underset{\uparrow}{1}, 1, 1, 1, 1 \}$	1
(d)	Find the Fourier transform of the signal given below: $x(t) = e^{-at} u(t)$ and sketch the magnitude and phase spectrum.	3
(e)	Using Fourier transform, find the convolution of $x_1(t) = e^{-2t} u(t)$, $x_2(t) = e^{-3t} u(t)$	3

SECTION C**3. Attempt any one part of the following:****10*1 = 10**

Qno	Questions	CO
(a)	Find the inverse Laplace of the following $X(S) = \frac{2}{(s+4)(s-1)}$ if the region of convergence is a) $-4 < \text{Re}\{s\} < 1$	3



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	b) $\text{Re}\{s\} > 1$	
(b)	Using Laplace transform obtain the impulse response of the given second-order system $\frac{d^2y(t)}{dt^2} + 3\frac{dy(t)}{dt} + 2y(t) = x(t).$	3

4. Attempt any *one* part of the following: 10 *1 = 10

Qno	Questions	CO
(a)	Determine the Z transform of $x(n) = \cos(\omega_0 n) u(n)$ and sketch the ROC.	4
(b)	Determine the inverse Z transform of the following function $H(z) = \frac{0.2z}{(z+0.4)(z-0.2)} \quad \text{ROC} : z > 0.4$	4

5. Attempt any *one* part of the following: 10*1 = 10

Qno	Questions	CO
(a)	Explain and proof Parseval's Theorem.	3
(b)	Analyze the Discrete Time Fourier Transform of the following $x(n) = 0.5^n u(n) + 2^{-n} u(-n - 1)$	3

6. Attempt any *one* part of the following: 10*1 = 10

Qno	Questions	CO
(a)	Implement the Convolution integral on the signals $x(t) = e^{-2t} u(t)$ and $h(t) = u(t)$.	2
(b)	Implement the Convolution sum on the signals $x(n) = a^n u(n)$ and $h(n) = u(n)$.	2

7. Attempt any *one* part of the following: 10*1 = 10

Qno	Questions	CO
(a)	State and prove the Sampling theorem and discuss the effect of under-sampling.	5
(b)	Explain reconstruction of signal from its samples using Interpolation.	5