

Paper Id: **130316**Roll No: 

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**dB TECH**  
**(SEM-III) THEORY EXAMINATION 2019-20**  
**SIGNAL & SYSTEMS**

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

a.	Find the fundamental period of the given signal. $X(n) = \sin(6\pi n/7 + 1)$ .
b.	What is the relationship between z transform and Fourier transform?
c.	Find the Fourier transform of $x(t) = \sin(\omega t) \cos(\omega t)$ .
d.	Examine whether the signal is periodic or not. If periodic then find out the period. $x(t) = \sin(10t+1) - 2\cos(5t-2)$ .
e.	Consider a discrete time system with input $x(n)$ and output $y(n): y(n) = n[x(n)]^2$ . Is this system time variant or time invariant?
f.	State convolution property of Z transforms.
g.	An LTI system is described by the differential equation $dy(t)/dt + 4yt = x(t)$ . Determine its impulse response $h(t)$ and then $H(f)$ ?
h.	Find out the Laplace transform of the signal with its ROC. $X(t) = e^{-t}.u(t) + e^{-u}.u(t)$
i.	Prove the time differentiation property of Fourier transform
j.	Verify whether the given system described by the equation is linear and time invariant. $X(t) = t^2$

**SECTION B****2. Attempt any three of the following: 10x3=30**

a.	Find the continuous time Fourier transform of the gate/ rectangular signal. Also plot its magnitude response.
b.	Define invertible system and state whether the following systems are invertible or not. 1) $Y(n) = x(n)$ 2) $Y(n) = x^2(n) + 1$
c.	A discrete time system is given as $y(n) = y^2(n-1) + x(n)$ . A bounded input of $x(n) = 2n$ is applied to the system. Assume that the system is initially relaxed: check whether the system is stable or unstable.
d.	
e.	Given $x(t) = 5 \cos$ , $y(t) = 2e^{-t}$ , find the convolution of $x(t)$ and $y(t)$ using Fourier transform.

**SECTION C****3. Attempt any one part of the following: 10x1=10**

a.	Determine the z-transform of following sequences with ROC i) $U[n]$ ii) $-u[-n-1]$ iii) $X[n] = a^n u[n] - b^n u[-n-1]$
b.	State and prove initial and final value theorem for z transform.

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**4. Attempt any one part of the following: 10x1=10**

a.	Explain sampling and quantization. What is the difference between uniform and non uniform sampling and quantization?
b.	i) Determine whether the following signal is energy or power signal. $X(n) = u[n] - u[n-6]$ . ii) sketch the following signal $y(t) = \pi((t/3)-2) + \pi(2t-3.5)$

**5. Attempt any one part of the following: 10x1=10**

a.	i) Determine whether the system is BIBO stable or not. $Y(n) = \max[x(n+1), x(n), x(n-1)]$ ii) Check whether the system is static / dynamic and causal/ non causal and why? $Y(n) = \log_{10} x(n) $
b.	Find the Laplace transform for the parabolic function $x(t) = t^2 \cdot e^{-3t} \cdot u(t)$

**6. Attempt any one part of the following: 10x1=10**

a.	Determine the total response of the difference equation $Y(n) + 4y(n-1) + 4y(n-2) = (-2)^n u(n)$ Where $y(-1) = 0$ and $y(-2) = 1$
b.	i) Using Fourier transform, find the convolution of: $X_1(t) = e^{-2t} \cdot u(t)$ $X_2(t) = e^{-3t} \cdot u(t)$ ii) calculate the DTFT of the following using properties of DTFT $x(n) = u(n+3) - u(n-3)$

**7. Attempt any one part of the following: 10x1=10**

a.	Determine the total response of the differential equation $d^2y(t)/dt^2 + 3dy(t)/dt + 2y(t) = x(t)$ Where $y(0) = 3$ , $y'(0) = 4$ , $x(t) = 4e^{-2t}$ and $t \geq 0$ .
b.	Compare between CTFT and DTFT with examples.