

Paper Id: **120315**

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**B.TECH
(SEM III) THEORY EXAMINATION 2019-20
BASIC SYSTEM ANALYSIS**

Time: 3 Hours

Total Marks: 100

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

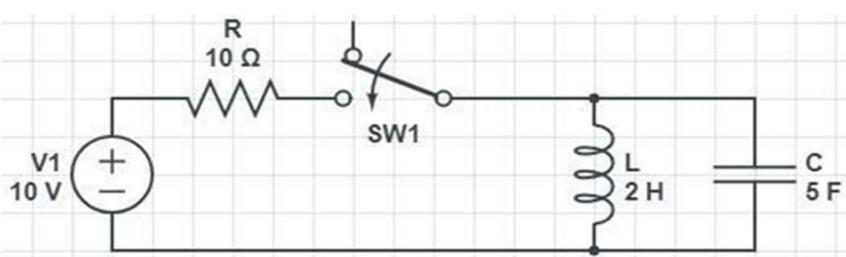
SECTION A

1. Attempt all questions in brief. 2 x 10 = 20

a.	Explain different type of signals?	2
b.	What is time invariant and time varying system?	2
c.	State Parseval's Theorem for CT Fourier Series.	2
d.	Find Fourier transform of $u(t-t_0)$.	2
e.	Determine the Laplace transform of $r(t-a)$.	2
f.	State the linearity property of the Laplace transforms.	2
g.	What do you mean by state of system?	2
h.	Explain state transition matrix.	2
i.	Explain the properties of ROC of Z transform	2
j.	if two signals are $x(n)=\{1,3,2,1\}$ and $y(n)=\{1,-2,3,2\}$ the find $x(n)+y(n)$.	2

SECTION B

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

a.	Explain Modeling of mechanical system and electrical system and then give the analogy between electrical and mechanical system.	10
b.	What do you mean by the existence of Fourier series? And explain properties of Fourier series.	10
c.	State and prove the Convolution Theorem	10
d.	Initially switch is closed for a long time and steady state condition has reached. At $t=0$ switch is opened. Find the expression of current through inductor. <div style="text-align: center;">  </div>	10
e.	Find the inverse Z-transform of the following function: $X(z)=1/(1+z^{-1})^2(1-z^{-1})$ ROC: $z > 1$	10

SECTION C

3. Attempt any one part of the following: 10 x 1=10

a.	For the given mechanical system draw the equivalent circuit using F-V and F-I analogy.	10
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b.	What is the total normalized energy of the signal? find the energy signal and power signal of the signal (i) $x(t) = \text{rect}(t/T_0)$ (ii) $x(t) = \cos^2 \omega_0 t$	10

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

a.	Explain the difference between Trigonometric and Exponential Forms of Fourier Series taking a suitable example.	10
b.	For a series RLC circuit having $R = 25\Omega$, $L = 15\Omega$, $C = 0.5\text{ f}$ supplied by a source of $10\delta(t)\text{ V}$. find the voltage across capacitor ($V_c(t)$) using inverse Fourier transform	10

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

a.	Find the response of the system having transfer function $H(S) = \frac{Y(S)}{X(S)} = \frac{S^2 + 3S + 5}{(S+1)(S+2)}$ for the input (i) $X(t) = \delta(t)$ (ii) $X(t) = e^{-2t}$	10
b.	Consider a series R-L circuit with $R = 8\text{ohm}$ and $L = 2\text{ mH}$ excited by a 24 V d.c. supply connected through a initially open switch. Initial current through the inductor is 2.5 amp. By using Laplace transform determine the current $i(t)$; $t \geq 0$. Also draw the s- domain representation of the circuit.	10

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

a.	Obtain the eigenvalue and state transition matrix of a system given by $A = \begin{bmatrix} -1/2 & -5/2 \\ 1/2 & -7/2 \end{bmatrix}$	10
b.	Obtain the state model for the electrical circuit given below <div style="text-align: center;"> </div>	10

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

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a.	(i) Explain the properties of z transform (ii) find z transform of $x(nT) = nT$ $U(nT) = r(nT)$ $y[n] - \frac{1}{2}y[n-1] - \frac{1}{2}y[n-2] = x[n]$ calculate (i) the system function $H(z)$ (ii) The impulse response $h[n]$ of the system	10
b.	Find impulse response of the system with system function is given by $H(z) = \frac{(2 - 2.5z^{-1})}{(1 - 0.5z^{-1})(1 - 2z^{-1})} ; z > 2$	10