Printed Pages: 03 **Subject Code: EEE301/EE302/NEE303**

Paper Id: **120315** **Roll No:** | | | | | | | | | | |

BTECH
(SEM-III) THEORY EXAMINATION 2018-19
BASIC SYSTEM ANALYSIS

Time: 3 Hours ***Total Marks:100***

Notes: *Assume any Missing Data.*

SECTION – A

(1) Attempt **all** parts. Each part carries **equal** marks. **(10×2= 20)**

(a) Write propeties of Z-transform.

(b) Define unit steps and unit ramp signals with proper sketch.

(c) Determine whether or not signal x (t) = $\cos\frac{2\pi n}{7}$ $\sin\frac{3\pi n}{14}$ is periodic. If periodic find its fundamental period.

(d) Write Dirichlet's condition for the existance of Fourier series.

(e) Sketch the signal y(t)= r(t+2) –r(t)+r(t-2).

(f) Find Z-transform of unit step and impulse function.

(g) Find the Laplace transform of cosωt.

(h) Define State and State variable.

(i) Write the properties of ROC.

(j) Define STM..

SECTION – B

(2) Attempt any ***three*** questions. Each question carries **equal** mark **(10×3= 30)**

(a) Determine the Fourier transform of the following function.

(i) $f(t) = e^{-at}$ for all value of t

(ii) f (t) = 1, $-\infty < t < \infty$

(iii)Unit impulse function,

(b) Find the Laplace transform of the waveforms as shown in fig. 1 & 2.

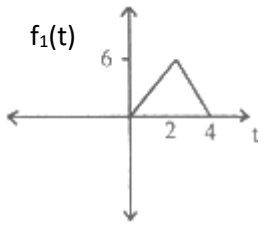


Fig. 1

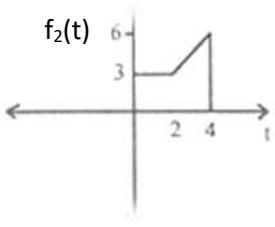


Fig. 2

(c) Determine Z-Transform of the following sequences with ROC

(i) x (n) = $\left(\frac{1}{2}\right)^n$; $0 \le n \le 6$

x (n) = 0 ; otherwise

(ii) x(n) = n^2u(n) + nu(n)

(d) A second-order Discrete Time system is described by the difference equation

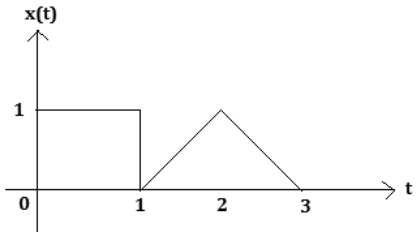
$$y(n) - 3y(n-1) + y(n-2) = x(n)$$

Determine: -

(i) H(z), the system function,

(ii) h(n), the unit-impulse response.

(e) Sketch (i) x $(-\frac{t}{2} + 2)$ & (ii) x (-2t - 3) if x(t) is



Section – C

(3) Attempt any **one** question. **(10×1= 10)**

(a) A vector matrix differential equation of a system is given by

$$\dot{X} = \begin{bmatrix} 0 & 1 \\ -6 & 5 \end{bmatrix} X + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$$

and output $Y = [1\ 0]X$

With initial conditions being zero. Find time response of the above system.

(b) Find the state transition matrix for the system matrix having

$$A = \begin{bmatrix} 0 & -1 \\ 2 & -3 \end{bmatrix}$$

(4) Attempt any one question. **(10×1= 10)**

(a) Find the inverse Z-transform of the following function:

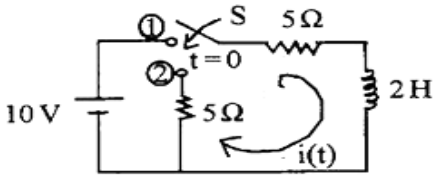
(i) $X(Z) = \frac{1-\frac{1}{3}Z^{-1}}{(1-Z^{-1})(1-2Z^{-1})}$ $\quad |Z| > 2$

(ii) $X(Z) = \frac{1-\frac{5}{6}Z^{-1}}{(1-\frac{1}{4}Z^{-1})(1-\frac{1}{3}Z^{-1})}$ $\quad |Z| > \frac{1}{3}$

(b) Prove convolution theorem of Z-transform.

(5) Attempt any one question. **(10×1= 10)**

(a) In the circuit shown in figure, determine the current i(t) when the switch is at position 2. The switch S is moved from position 1 to position 2 at t=0. Initially the switch is at position 1 for a long time.



(b) State and prove initial and final value theorem of Laplace transform.

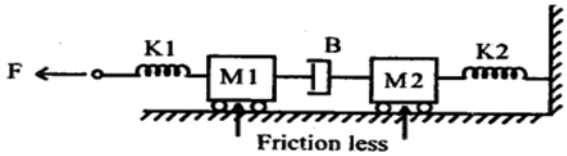
(6) Attempt any one question. **(10X1=10)**

(a) Find trigonometric Fourier series representation of $x(t) = e^{at} u(t)$.

(b) State and prove dualityproperty of Fourier transform.

(7) Attempt any one question. **(10X1=10)**

(a) Write mechanical balanced force equation & draw electrical analogous by the force voltage analogy of given mechanical system



(b) What are the properties of continuous time linear system? Consider a continuous time system, the input and output is related by $y(t)=t^2(t-1)$. Determine whether the system is linear or non-linear.