Printed Pages : 4

EC-303(MTU)

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 912303

Roll No.

B. Tech.

(SEM. III) (ODD SEM.) THEORY EXAMINATION, 2014-15

SIGNALS & SYSTEMS

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

Note : Attempt all questions.

SECTION - A

1 Attempt **all** parts of this question : **(2×10=20)**

(a) Determine the Nyquist rate for the continuous time signal $x(t) = 5\cos 50\ \pi t + 20 \sin 300\ \pi t$.

(b) Find f(0) if $F(s) = (s+8)/s^2+6s+13$, using initial value theorem.

(c) Find the Fourier transform of $x(t) = sgn(t)$ or $u(t)$

(d) Find the Z transform of the following sequence $x(n) = 3\ \delta(n) + \delta(n-3) + \delta(n+3)$.

(e) Determine and sketch the even and odd components of the continuous time signal $x(t) = 10e^{-2t} u(t)$.

(f) Determine the energy of signal $u(n) - u(n-1)$.

(g) Write time scaling and differentiation in s domain property of Laplace transform.

(h) Determine the final value of $x(z) = (8Z-7)Z/4Z^2-7Z+3$

(i) State the condition of existence: convergence of Laplace transform.

(j) Is the signal $2\cos t + 3\cos(t/3)$ periodic or not. If periodic, determine fundamental period.

SECTION - B

2 Attempt any **three** parts : **(3×10=30)**

(a) Define signal. Classify the different type of signal in detail using time domain technique.

(b) For discrete time system $y(n)= x(-n+2)$ and $y(n) = x(n) + nx(n+1)$, check whether the system are static or dynamic, linear or non linear, shift invariant or shift varing, causal or non causal

(c) (i) Explain the relation between Laplace and Fourier transform.

(ii) Find the DTFT of $x(n) = (1/2)^{n-1}u(n-1)$.

(d) Determine the CTFT of a Continuous time signal $x(t) = e^{-At}u(t)$.

SECTION – C

Attempt **all** questions of this section : **(5×10= 50)**

3 Attempt any **one** part :

(a) An LTI system is described by the difference equation $d/dt\ y(t)+ \alpha\ y(t) =x(t)$. Evaluate the impulse response and plot the magnitude and phase spectrum.

(b) (i) State and prove the Sampling Theorem

4 Attempt any **one** part :

(a) Discuss any two property of z transform and determine the z transform, region of convergence of the discrete time signal given as $x(n)= a^n$ for n is greater than or equal to zero, otherwise x(n) zero

(b) A system is described by the following difference equation, $y(n) = 1/2y(n-1) + x(n)$. Input given to the system is $(1/3)^n u(n)$ and initial condition is $y(-1) =1$. Determine (i) Zero input response (ii) Zero state response (iii) Total response.

5 Attempt any **one** part :

(a) Determine the inverse Z-transform of the following X(z) by the partial fraction expansion method :

$X(z)= (Z+2)/(2Z^2-7Z+2)$

If the ROC are (i) $|Z| > 3$ (ii) $|Z| < \frac{1}{3}$ (iii) $\frac{1}{2} < |Z| < 3$

(b) Prove initial value theorem and final value theorem.

6 Attempt any **one** part :

(a) Solve the differential equation using Laplace method $dy(t)/dt+5y(t)= x(t)$. with initial condition $y(0+)= -2$ and $x(t)= 3e^{-2t} u(t)$.

(b) Determine the system response y(t) for a system given below to input $x(t) = e^{3t}u(t)$ and

7 Attempt any **one** part :

(a) (i) Explain any two properties of continuous time fourier transform

(ii) Explain any two properties of discrete time fourier transform

(b) Solve the following differential equation $d^2y(t)/dt^2 + 4dy(t)/dt + 5y(t) = 5x(t)$ with $y(0-) = 1$ and $y'(0-) = 2$ and input $x(t) = u(t)$ using laplace method.