

B.Tech. 4th Semester (ECE) - (F-Scheme)
Examination, May-2018
SIGNALS AND SYSTEMS
Paper-EE-228-F

Time allowed : 3 hours] [Maximum marks : 100

Note: Attempt five questions. Question No. 1 is compulsory and attempt one question from each of the four sections.

1. (a) Discuss energy and power signals. 5
(b) Write down the time differentiation and integration property of Fourier transform. 5
(c) A continuous time causal stable LTI system has the following response

$$H(j\omega) = \frac{1 - j2\omega}{1 + j2\omega}$$

Determine (i) $|H(j\omega)|$ and

(ii) Group Delay $T(\omega)$ 5

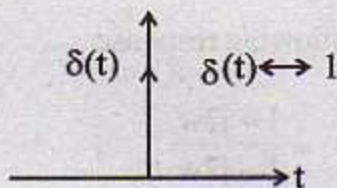
- (d) Explain S to Z plane mapping with help of an illustration. 5

Section-A

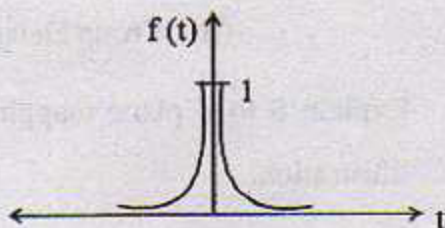
2. Explain the following signals with help of illustrations:
- Continuous time and Discrete time
 - Periodic and Non-Periodic
 - Even and Odd
 - Energy and Power 20
3. Discuss the following signals :
- Unit step
 - Unit impulse
 - Unit ramp
 - Exponential 20

Section-B

4. (a) Obtain the Fourier transform of following :
- Impulse function



- Exponentially decaying function



10

- (b) Obtain the Fourier transform spectrum $G_T(\omega)$ of the rectangular pulse defined as

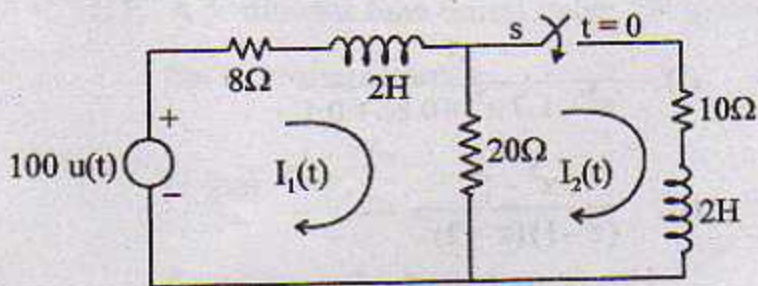
$$g_T(t) = \begin{cases} 1 & |t| \leq T/2 \\ 0 & \text{otherwise} \end{cases}$$

Also sketch the gate function. 10

5. State all the properties of Fourier transform with their proofs. 20

Section-C

6. (a) In given circuit switch is closed at $t = 0$. Find out the currents $I_1(t)$ and $I_2(t)$.



- (b) Find the two sided Laplace Transform and ROC of the signal $f(t) = e^{3t} u(-t) + e^{2t} u(t)$. 10

7. (a) Prove that ideal filters have constant gain, constant group and phase delays. 10
- (b) Find the transfer function for Low Pass RC filter. Also draw its magnitude and phase spectrum. 10

Section-D

8. Find the z-transform of the following signals :

(i) $\mu(k)$

(ii) $(k + 1) a^k$

(iii) $b^k \sin ak$

(iv) $\cos ak$

20

9. Find inverse z-transform of the following :

(i)
$$\frac{z^2}{z^3 - 1.7z^2 + 0.8z + 0.1}$$

(ii)
$$\frac{z^2 - 5}{(z - 1)(z - 2)^2}$$