

# Ajay Kumar Garg Engineering College, Ghaziabad

## Department of EN

### Sessional Test-2

Course: B. Tech.  
 Session: 2017-18  
 Subject: Basic Signal & Systems  
 Max Marks: 50

Semester: 2<sup>nd</sup>  
 Section: EN-1, EN-2  
 Sub. Code: REE-303  
 Time: 2 hour

Note: Answer **all** the sections.

#### Section-A

A. Attempt **all** the parts.

(5x2=10)

1. Differentiate between Fourier series and Fourier transform.
2. Write Dirichlet conditions for the existence of Fourier series.
3. Find the Fourier transform of  $e^{-at}u(t)$ .
4. Find the Laplace transform of  $(1 + 0.5 \sin(t)) \sin(1000t) u(t)$ .
5. Find the Laplace transform of the signal shown in figure 1.

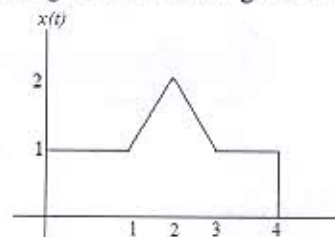


Figure 1

#### Section-B

B. Attempt **all** the parts.

(5x5=25)

6. Prove the frequency shifting property and time scaling property of Fourier series.
7. State and prove the duality property of Fourier transform. Using duality property, find the Fourier transform of  $g(t) = 1/(1 + jt)$ .
8. Using Laplace transform solve the following differential equation.  

$$\frac{d^2 y(t)}{dt^2} + 5 \frac{dy(t)}{dt} + 4y(t) = 2x(t)$$

$$x(t) = e^{-2t}u(t) \text{ \& } y(0^-) = -2, \frac{dy(0^-)}{dt} = -1$$
9. The output of a linear system is  $y(t) = 10e^{-t} \cos(4t) u(t)$  when the input is  $x(t) = e^{-t}u(t)$ . Find the transfer function of the system and its impulse response.
10. Assuming zero initial conditions, find the  $v_o(t)$  in the circuit of figure 2.

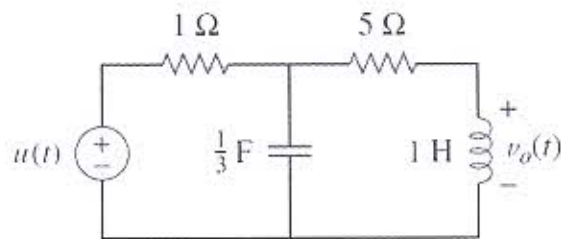


Figure 2

### Section-C

C. Attempt **all** the parts.

(2x7.5=15)

11. Using the Fourier transform, find  $v(t)$  in the circuit shown in figure 3.

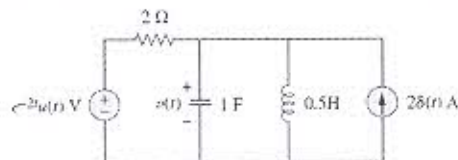


Figure 3

12. The switch in figure 4 has been in position  $b$  for a long time. It is moved to position  $a$  at  $t=0$ . Using Laplace transform, determine the value of  $v(t)$  for  $t>0$ .

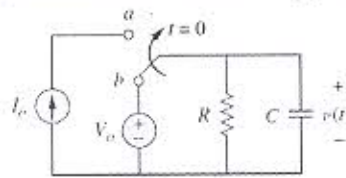


Figure 4