Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 52439

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2017

Third Semester

Electronics and Communication Engineering

EC 2204 : SIGNALS AND SYSTEMS

(Common to Biomedical Engineering)

(Regulations 2008)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A (10×2=20 Marks)

1. Plot the signal x[n] = u[n] – u[n – 4].

2. Determine whether the signal $x(t) = \cos \frac{\pi}{2} t$ is periodic or not. Also find its period if it is periodic.

3. State Dirichlet's conditions and its significance in continuous time Fourier series representation.

4. Find the Laplace transform of the signal $x(t) = -e^{-at} u(-t)$, and its associated ROC.

5. Two systems with impulse response $h_1(t)$ and $h_2(t)$ respectively are connected in series. What is the overall impulse response of the system ?

6. An LTI system with input x(t) and impulse response h(t) produces an output y(t). What is the output of the same system if the input is $x(t - t_0)$ and impulse response is $h(t - t_1)$?

7. Find the corresponding discrete time signal x(n) for the analog sinusoidal signal $x(t) = \cos 40\pi t$ if it is sampled at a rate of $F_s = 60$ Hz.

8. Find the z-transform of the signal $x(n) = \delta[n - k]$ for $k > 0$. Also specify its ROC.

9. Convolve the following signals $x(n) = \{1, \underset{\uparrow}{2}, 3\}$ and $h(n) = \{1, \underset{\uparrow}{1}, 2\}$.

10. Determine the z-transform of the following signal $x(n) = \alpha^n u[n]$, $|\alpha| > 1$ and also specify whether Fourier transform of the signal exists.

PART – B **(5×16=80 Marks)**

11. a) i) Determine whether the discrete time system $y[n] = nx[n-1] + 3$ is linear, time invariant, memoryless and causal. Justify your answers, with proof. **(10)**

ii) "Any arbitrary signal x(n) can be represented as a linear combination of weighted shifted impulses $\delta[n-k]$". Justify this statement with an example. **(6)**

(OR)

b) Given $x[n] = \{3, 2, 1, \underset{\uparrow}{0}, 1, 2, 3\}$ plot the following signals.

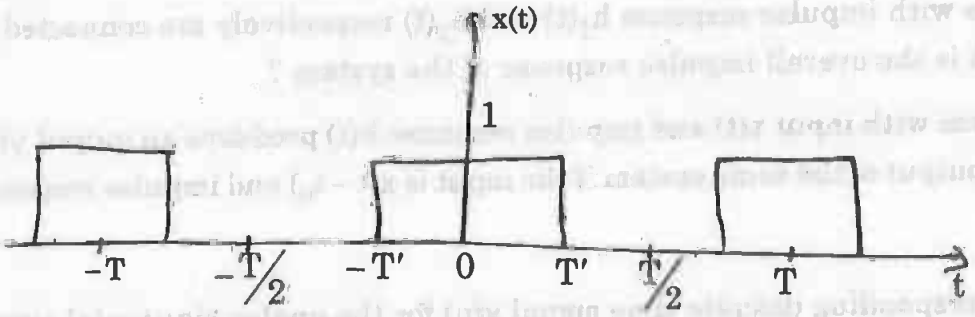
i) $x[-2n + 1]$

ii) $x[n]\, u[1 - n]$

iii) $x[n]\, \{u[n+2] - u[n]\}$

iv) $x[n] + \{u[n] - u[n-4]\}$

12. a) Find the Fourier series coefficients of the signal shown below.



Also plot its magnitude and phase spectrum.

(OR)

b) Find the Laplace transform of the signal $x(t) = \cos \Omega_0 t\, u(t)$ and also specify its ROC.

13. a) Consider a continuous time LTI system described by $\frac{d}{dt}y(t) + 2y(t) = x(t)$ using Fourier transform find the output y(t) for the input signal $x(t) = e^{-t}\,u(t)$.

(OR)

b) Using convolution integral formula convolve the following signals. $x(t) = e^{-t}u(t)$ and $h(t) = e^{-2t}\,u(t)$.

14. a) State and explain sampling theorem with necessary equations and illustrations.

(OR)

b) State and prove any four properties of z-transform.

15. a) Find the inverse z-transform of $x(z) = \frac{z}{z^2 - 0.25z - 0.375}$ by using partial fraction method for the following ROCs.

i) ROC : $|z| > 0.75$ ii) ROC : $|z| < 0.5$.

(OR)

b) Given the difference equation representation of the system $y[n] - \frac{3}{4}y[n-1] + \frac{1}{8}y[n-2] = x[n] - \frac{1}{2}x[n-1]$. Find the response y[n] for the input $x[n] = \left(\frac{1}{2}\right)^n u(n)$ using DTFT.