BE Semester-_5th___ (Biomedical Engineering) Question Bank

(SIGNALS AND SYSTEMS)

All questions carry equal marks (10 marks)

Q.1	**Sketch and mathematically describe the functions which are given below.** • $x(t) = 3e^{2t}$, $-5 \leq t \leq 5$ • $x(t) = u(t) - u(t-4)$ • $x(t) = u(t-3) - u(t-4) + u(-t)$ • $x(n) = u(n) + u(n-5) + \delta(n)$ • $x(t) = u(n-1) - u(n-4) + u(-n+1)$
Q.2	Write the classification of signals & explain size of signals.
Q.3	Define zero-input response of the system. How to find zero-input response of continuous time and discrete time systems?
Q.4	(a) Explain in detail signal models. (b) Explain even and odd functions of signals
Q.5	Write the classification of systems with one example.
Q.6	Explain system model: input-output description.
Q.7	Explain the various system models in detail.
Q.8	Determine whether the following systems are static or Dynamic, Linear or Nonlinear, Shift variant or Invarient, Causal or Non-causal, Stable or unstable. $y(t)=x(t+10)+x^2(t)$ $dy(t)/dt + 10\ y(t) = x(t)$
Q.9	Determine whether the following systems are static or Dynamic, Linear or Nonlinear, Shift variant or Invarient, Causal or Non-causal, Stable or unstable. $dy(t)/dt + 6\ y(t) = 4x(t)$ $y(t) = \sin(x(t))$
Q.10	Determine whether the following systems are static or Dynamic, Linear or Nonlinear, Shift variant or Invarient, Causal or Non-causal, Stable or unstable. 1. $y[n]+2y[n-1]=x[n-1]$ 2. $y[n+1]+4y[n]=3x[n+1]-x[n]$
Q.11	Determine whether the following systems are static or Dynamic, Linear or Nonlinear, Shift variant or Invarient, Causal or Non-causal, Stable or unstable. 1. $y[n]=x^2[n]+x[n]$ 2. $y[n]=x[n]+(1/x[n+1])$
Q.12	Determine whether the following systems are static or Dynamic, Linear or Nonlinear, Shift variant or Invarient, Causal or Non-causal, Stable or unstable. 1. $y[n]=2x[n]+(1/x[n-1])$ 2. $y[n]=x[n]x[n-1]$
Q.13	Define unit impulse response. How to find unit impulse response of system? Also explain simplified impulse matching method.
Q.14	Define zero-state response of the system. How to find zero-state response of continuous time and discrete time systems?
Q.15	Describe properties of Convolution Integral.
Q.16	Write short note on: System stability
Q.17	Find the zero-input response for an LTIC system described by the following equations: $(2D^2+D-3)\ y(t) = Dx(t)$ when the initial conditions are $y_0(0)=0$, $dy_0(0)/dt$

	= -5.
Q.18	Find the total response for an LTIC system described by the following equations :$(D^2+2D+1)\ y(t) = x(t)$ when the initial conditions are $y(0)=1$, $dy(0)/dt=4$.
Q.19	Find the unit impulse response h (t) for a system specified by , • $(D^2+5D+6)\ y\ (t) = D\ x\ (t)$ • $(D^2+3D+2)y(t) = D\ x(t)$
Q.20	a) For an LTIC system with the unit impulse response $h(t) = e^{-2t}\,u(t)$, determine the response y(t) for the input $x(t) = e^{-t}\,u(t)$. b) For an LTIC system with the unit impulse response $h(t) = 6e^{-t}\,u(t)$, determine the response y(t) for the input $x(t) = 2\,u(t)$.
Q.21	a) For an LTIC system with the unit impulse response $h(t) = 6e^{-t}\,u(t)$, determine the response y(t) for the input $x(t) = 3e^{-3t}\,u(t)$. b) For an LTIC system with the unit impulse response $h(t) = 2e^{t}\,u(t)$, determine the response y(t) for the input $x(t) = 3\,u(t)$.
Q.22	Determine graphically $y(t)=x(t)*h(t)$ for $x(t)= e^{-t}\,u(t)$ and $h(t) = e^{-2t}\,u(t)$.
Q.23	Solve the differential equation, $(D^2+3D+2)y(t) = Dx(t)$ if the initial conditions are $y(0^+)=2$ and $dy(0^+)/dt=3$ and the input is $10e^{-3t}$ and e^{-2t}.
Q.24	For an LTID system described by the difference equation, $y[n+2]-0.6y[n+1]-0.16y[n]=5x[n+2]$, Find the zero-input response if the initial conditions are $y[-1]=0$ and $y[-2]=25/4$.
Q.25	For an LTID system described by the equation, $(E^2 - 3E + 2)\ y[n] = (E+2)\ x[n]$, find the forced response for the input $x[n] = (3)^n u[n]$.
Q.26	Using graphical method, obtain a convolution of two DT signals defined as, $x(n) = (2.5)^n$, $0 \le n \le 2$ $y(n) = 2n-3$, $0 \le n \le 3$
Q.27	Explain z-transform and its properties.
Q.28	Explain in detail frequency response of discrete time systems.
Q.29	Describe connection between the Laplace Transform and z-Transform. Write the properties of Bilateral z-transform.
Q.30	Find the Z-transform of following signals: $x[n] = u[n]$ $x[n] = u[n]-u[n-6]$
Q.31	Find the inverse Z-transforms of following signals: $X(z) = (z-1)\ (z+0.8) / (z-0.5)\ (z+0.2)$ $X(z) = (z+0.8) / (z-0.5)\ (z+0.2)$
Q.32	Solve the following differential equation using Z-transform: $y[n] + 3y[n-1] +2\ y[n-2] = 2x[n] – x[n-1]$; $y[-1] = 0$; $y[-2] = 1$; $x[n] = u[n]$.
Q.33	Find the response y[n] of an LTID system described by the difference equation, $y[n+2] + y[n+1] + 0.16\ y[n] = x[n+1] +0.32\ x[n]$ for the input $x[n]=(2)^n u[n]$ and with all the initial conditions zero using Z-transform.
Q.34	Write the properties of Fourier transform. Also describe the Aperiodic signal representation by Fourier Integral.
Q.35	Explain amplitude modulation and data truncation.
Q.36	Write short note on sampling theorem and signal reconstruction.
Q.37	Explain in detail analog to digital conversion.

Q.38	Use DFT to compute the Fourier transform of e^{-2t} u(t). Plot the resulting Fourier spectra.
Q.39	Determine whether the following systems are static or Dynamic, Linear or Nonlinear, time variant or Invarient, Causal or Non-causal, Stable or unstable. 1. $y[n] = nx^2[n]$ 2. $y[n]=x[n/2]$
Q.40	Find power and energy of the following given signals: • $x(n) = (\frac{1}{3})^n$ u(n) • $x(n) = e^{j(\frac{\pi}{2}n+\frac{\pi}{4})}$