BRAINWARE UNIVERSITY

Term End Examination 2023

Programme – B.Tech.(CSE)-2018/B.Tech.(CSE)-2019/B.Tech.(CSE)-2020

Course Name – Signals and Systems

Course Code - ESC(CSE)501

(Semester V)

Full Marks : 60 **Time : 2:30 Hours**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question) 1 x 15=15

1. *Choose the correct alternative from the following :*

(i) What are the conditions called which are required for a signal to fulfil to be represented as Fourier series?

a) Dirichlet's conditions
b) Gibbs phenomenon
c) Fourier conditions
d) Fourier phenomenon

(ii) What are the two types of Fourier series?

a) Trigonometric and exponential
b) Trigonometric and logarithmic
c) Exponential and logarithmic
d) Trigonometric only

(iii) If G(f) represents the Fourier Transform of a signal g (t) which is real and odd symmetric in time, then G (f) is _____

a) Complex
b) Imaginary
c) Real
d) Real and non- negative

(iv) Is the function y[n] = y[n-1] + x[n] stable in nature?

a) It is stable
b) It is unstable
c) Both stable and unstable
d) None of the mentioned

(v) If n tends to infinity, is the accumulator function a stable one?

a) The function is marginally stable
b) The function is stable
c) The function is unstable
d) None of the mentioned

(vi) Determine the discrete-time signal: x(n)=1 for n>=0 and x(n)=0 for n<0

a) Unit ramp sequence
b) Unit impulse sequence
c) Exponential sequence
d) Unit step sequence

(vii) x(t) = Ax(t) Bu(t) is called the :

a) system equation
b) state equation
c) state transition equation
d) none of these

(viii) Using state variables, an nth – order differential equation can be decomposed into :

a) n number of first – order differential equations
b) n/2 number of first – order diffferential equations

c) unlimited number of first – order differential equations
d) none of these

(ix) An example for non-causal system is _____

a) Amplifier
b) Oscillator
c) Rectifiers
d) Does not exists

(x) In a continuous-time physical system, memory is directly associated with _____

a) Storage registers
b) Time
c) Storage of energy
d) Number of components in the system

(xi) Zero-order hold used in practical reconstruction of continuous-time signals is mathematically represented as a weighted-sum of rectangular pulses shifted by:

a) Any multiples of the sampling interval
b) Integer multiples of the sampling interval
c) One sampling interval
d) 1 second intervals

(xii) Which of the following systems is linear?

a) y(t) = sin(x(t))
b) y(t) = log(x(t))
c) y(t) = cos(x(t))
d) y(t) = dx(t)/dt

Group-B

(Short Answer Type Questions) 3 x 5=15

2. Examine the overall impulse response h (t) when two systems with impulse response h1 (t) and h2(t) are in parallel and in series? (3)
3. Explain the DTFT and IDTFT of a sequence. (3)
4. How z-transform is correlated to Fourier transform. (3)
5. The impulse response of the LTI-CT system is given as h(t) = e^(-t) u(t). Show the transfer function and check whether the system is causal and stable. (3)
6. (a) Justify aliasing or folding. (b) Develop the condition to avoid the aliasing effect. (3)

OR

Assume a signal x(t) = 6cos10?t sampled at 7Hz and 14Hz. Test the effect of sampling a signal at both frequencies less than and greater than twice the highest frequency. Plot the output of the reconstruction filter. (3)

Group-C

(Long Answer Type Questions) 5 x 6=30

7. Define the power and RMS value of signal x(t)=20cos2?t. (5)
8. State and explain the time-shifting property of discrete-time Fourier Transform. (5)
9. Calculate the trigonometric Fourier series for a half-wave rectified sine wave. (5)
10. Calculate the inverse z-transform of x(z) = (z^2+z) / (z-1)(z-3), ROC: z > 3. Using (i) the Partial fraction method, (ii) the Residue method, and (iii) the Convolution method. (5)
11. Evaluate the region of convergence of the Laplace transforms by an example. (5)
12. (a) Define state variables. (b) Evaluate the general form of the state variable matrix. (5)

OR

(a) Justify the methods of state space representation for phase variables. (b) Evaluate the solution of homogenous state equations. (5)

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