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Question Paper Code: 41444

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2016

Fourth Semester

Electronics and Communication Engineering

14UEC404 - SIGNALS AND SYSTEMS

(Regulation 2014)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

- Which of the following is a signal?
 - mobile phone
 - walkie-talkie
 - personal computer
 - human speech
- A signal is defined at every instant of time is
 - output signal
 - input signal
 - DT signal
 - CT signal
- Fourier series is only applicable for
 - Energy signals
 - power signals
 - a periodic signals
 - periodic signals
- The frequency response is usually represented in a graph by its
 - magnitude
 - phase
 - both magnitude and phase
 - none of these
- The Laplace transform of $u(t)$ is
 - $1/s$
 - s^2
 - $1/s^2$
 - s

6. Bilateral and Unilateral Laplace Transform differs in terms of
- (a) lower limit of integration (b) upper limit of integration
(c) they are same (d) bilateral transform does not exist
7. Application sampling
- (a) speech only (b) audio only
(c) 3D sampling only (d) all the above
8. The Drawback of DTFT is
- (a) 0 inverse is in CT (b) inverse is in DT
(c) all the above (d) none of these
9. Convolution is used to find
- (a) amount of similarity between the signals (b) response of the system
(c) multiplication of the signals (d) Fourier transform
10. The Z transform of $\delta(n - m)$ is
- (a) z^{-n} (b) z^{-m} (c) $1/z-n$ (d) $1/z-m$

PART - B (5 x 2 = 10 Marks)

11. Define and Relation between unit step, ramp and Delta functions for CT.
12. Give the equation for trigonometric Fourier series.
13. Solve the Laplace transform of Unit step function.
14. State the Parseval's theorem.
15. List and draw the basic elements for the block diagram representation of DT system.

PART - C (5 x 16 = 80 Marks)

16. (a) (i) Examine whether the following signal is periodic or not? If periodic determine the fundamental period. (i) je^{j6t} , (ii) $X(t) = 3u(t) + 2 \sin 2t$, (iii) $x(n) = \cos 4n$
(iv) $x(n) = 1 + e^{j2\pi n/3} - e^{j4\pi n/7}$. (8)
- (ii) Express the following: (a) The power of the energy signal is Zero over infinite time (b) The energy of the power signal is infinite over infinite time. (8)

Or

- (b) Analyze whether the following systems are: 1. Static or Dynamic 2. Linear or non-linear
3. Causal or non-Causal 4. Time invariant or Time Variant.

(i) $d^3y(t)/dt^3 + 2 d^2y(t)/dt^2 + 4 dy(t)/dt + 3 y^2(t) = x(t+1)$

(ii) $y(t) = a t^2 x(t) + b t x(t-4)$

(iii) $y(n) = a^n u(n)$

(iv) $y(n) = x(n) x(n-2)$ (16)

17. (a) Summarize the Fourier series expansion of the half wave rectified sine wave. (16)

Or

- (b) The input and output of a causal LTI system are described by the differential equation: $d^2y(t)/dt^2 + 3 dy(t)/dt + 2y(t) = x(t)$.

(i) Calculate the frequency response of the system

(ii) Calculate the impulse response of the system

(iii) Criticize the response of the system if $x(t) = te^{-t} u(t)$? (16)

18. (a) (i) Develop $H(S) = S(S+3)/(S+2)(S+1)(S+4)$ Using Cascade form. (8)

(ii) Develop $H(S) = S+1/(S+2)(S+3)(S+4)$ using parallel form realization. (8)

Or

- (b) Estimate the inverse Laplace Transform of the following Equation

(i) $X(s) = S^2+3S+4/S^3+5S^2+7S+3$. (8)

(ii) $X(s) = S^2/S^4+4a^4$. (8)

19. (a) Describe a real value band limited signal having no spectral components above a frequency of B Hz is determined uniquely by its values at uniform interval spaced no greater than $1/2B$ second apart. (16)

Or

- (b) (i) Calculate the convolution of two signals using DTFT. $X_1(n) = (1/3)^n u(n)$ and $x_2(n) = (1/4)^n u(n)$. (8)

(ii) Calculate the DTFT of $x(n) = \cos(n\pi) u(n)$. (8)

20. (a) (i) Find the Z-transform and ROC of the sequence $x(n) = r^n (\sin \omega n) u(n)$. (8)

(ii) Find the inverse Z-transform of the function

$$X(z) = \frac{1}{1 + z^{-1} + z^{-2}} \quad \text{ROC : } |z| > 1 \quad (8)$$

Or

(b) Find the state variable matrices A , B , C and D for the equation

$$y(n) - 3y(n - 1) - 2y(n - 2) = x(n) + 5x(n - 1) + 6x(n - 2). \quad (16)$$
