[9]

Seat No.: _____

SARDAR PATEL UNIVERISTY

Bachelor of Science (Semester III) Examination - 2022
US03CELC51: SIGNAL PROCESSING

Date: 19/11/2022 (Saturday)
Time: 10:00 A.M. to 01:00 P.M.

Total: 70 Marks

NOTE:
1. Figure to the right indicate full marks of the questions.

Q-1 Multiple Choice Questions [10]

1. The electrical signals derived in proportion with physical quantities such as temperature, pressure, sound etc. are generally _____signals.
   (A) Continuous   (C) Digital
   (B) Discrete   (D) None of these

2. _____signals have values only at certain instants of time.
   (A) Continuous   (C) Periodic
   (B) Discrete   (D) All of the above

3. The frequency band limits for Audio Frequency band is
   (A) 1.5 Hz to 100 KHz   (C) 100 KHz to 500 KHz
   (B) 20 Hz to 20 KHz   (D) 20 Hz to 2000 KHz

4. The resonant frequency for an LC tunes circuit is given by
   (A) $f = \frac{1}{2\pi\sqrt{LC}}$ (C) $f = \frac{2}{2\pi\sqrt{LC}}$
   (B) $f = \frac{1}{4\pi\sqrt{LC}}$ (D) None of the above

5. In frequency synthesized signal generator, _____is used as reference frequency source.
   (A) Phase shift oscillator   (C) Quartz crystal oscillator
   (B) Wein bridge oscillator   (D) Colpitts oscillator

6. Cos $n\pi$ =
   (A) $-n$ (C) 0
   (B) $(-1)^n$ (D) 1

7. The fourier series for f(x) in the interval $\alpha < x < \alpha + 2\pi$ is given by
   (A) $f(x) = \frac{a_o}{2} + \sum_{n=0}^{\infty} a_n \cos nx + \sum_{n=0}^{\infty} b_n \sin nx$
   (B) $f(x) = a_o + \sum_{n=0}^{\infty} a_n \cos nx + \sum_{n=0}^{\infty} b_n \sin nx$
   (C) $f(x) = \frac{a_o}{2} + \sum_{n=0}^{\infty} a_n \sin nx + \sum_{n=0}^{\infty} b_n \cos nx$
   (D) None of the above

8. Even function is symmetrical about
   (A) X-axis   (C) Origin
   (B) Y-axis   (D) All of the above

9. Laplace transform of cosh(at)
   (A) s/s^2+a^2 (C) a/s^2+a^2
   (B) s/s^2-a^2 (D) None of the above

10. The Laplace transform of $e^{at}\sin bt$
    (A) $1/(s-a)^2 +b^2$ (C) $a/(s-a)^2 +b^2$
    (B) $b/(s-a)^2 +b^2$ (D) None of the above

Q-2 Short Answer Question (Attempt TEN out of TWELVE) [20]

1. Define a signal.

[1]

(P.T.O.)

2.   Give classification of signals
3.   Define rise time and fall time of a pulse.
4.   What are the important blocks of signal generator?
5.   What is function of PAD in piston type attenuator?
6.   Which types of waveforms are generated by integrator?
7.   Differentiate even and odd functions.
8.   Find a_0 for the Fourier series to represent x^2 in the interval ($-\pi$ to π).
9.   Give expressions for a_0, a_n and b_n for a Fourier series.
10.   Find Laplace's transform of $(Sin\ t - Cos\ t)^2$
11.   Find Laplace's transform of $Cos\ (at+b)$
12.   Find Laplace's transform of $t - Sinh2t$

Q.3(A) Show classification of signals and describe any two types of signals.   [08]
Q.3(B) Define Random signal with example.   [02]
                                        OR
Q.3(A) Explain pulse characteristics and terminology with neat diagram.   [08]
Q.3(B) Define Power signal.   [02]

Q.4(A) Explain in detail working of function generator.   [08]
Q.4(B) Define Attenuator and state its unit.   [02]
                                        OR
Q.4(A) Write a short note on sine wave generation.   [08]
Q.4(B) The frequency accuracy depends on design of which block of signal   [02]
        generator?

Q.5(A) Find Fourier series expansion of $f(x) = e^{-ax}$ in the interval $-\pi < x < \pi$.   [08]
Q.5(B) Find a_0 for Fourier series $xsinx$ in the interval ($-\pi$ to π)   [02]
                                        OR
Q.5(A) Find fourier series expansion of $f(x) = e^{-x}$ in the interval $0 < x < 2\pi$ [08]
Q.5(B) Find a_0 for Fourier series $xcosx$ in the interval ($-\pi$ to π)   [02]

Q.6(A) Find Laplace's transform of $e^{-3t}\ Sin\ 5t\ Sin\ 3t$ [05]
Q.6(B) Find Laplace's transform of $t^2\ e^{-3t}\ Sin\ 2t$ [05]
                                        OR
Q.6(A) Find Laplace's transform of $\frac{Cosat-Cosbt}{t}$ [05]
Q.6(B) Find Laplace's transform of $e^{-3t}(2cos5t-3sin5t)$ [05]

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