SEAT No.________

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[83]

Sardar Patel University
Signal Processing
US03CELC 21

Tuesday, 5-01-2021
2:00 pm to 4:00 pm
Marks 70

Q 1 : Multiple Choice Questions: (10)

(1) --------------------is a physical quantity which contains some information and which is function
of one or more independent variables.

- (i) Signal
- (ii) System
- (iii) Both (a) and (b)
- (iv) None of the above.

(2) Digital signals are ------------------time signals.

- (i) Discrete
- (ii) Continuous
- (iii) Discrete and continuous
- (iv) None of the above

(3) A signal is called as a ----------------if its average normalized power is non-zero and finite.

- (i) Power signal
- (ii) Energy signal
- (iii) Periodic signal
- (iv) Random

(4) The resonant frequency for an LC tunes circuit is given by

(i) $f = \frac{1}{2\pi\sqrt{LC}}$

(ii) $f = \frac{1}{4\pi\sqrt{LC}}$

(iii) $f = \frac{2}{2\pi\sqrt{LC}}$

(iv) None of the above

(5) If two attenuators are connected in cascade then total attenuation is given as

- (i) Subtraction of individual attenuator
- (ii) Addition of individual attenuator
- (iii) Product of individual attenuator
- (iv) Logarithmic of individual attenuators

(6) The fourier series for f(x) in the interval $\alpha < x < \alpha + 2\pi$ is given by

(i) $f(x)=\frac{a_o}{2}+\sum_{n=o}^{\infty}a_n\cos nx+\sum_{n=o}^{\infty}b_n\sin nx$

(ii) $f(x)=a_0+\sum_{n=o}^{\infty}a_n\cos nx+\sum_{n=o}^{\infty}b_n\sin nx$

(iii) $f(x)=\frac{a_o}{2}+\sum_{n=o}^{\infty}a_n\sin nx+\sum_{n=o}^{\infty}b_n\cos nx$

(iv) None of the above

(7) Odd function is symmetrical about

(i) X-axis
(ii) Y- axis
(iii) Origin
(iv) Z-axis

(8) The Laplace transform of e^{at}sinbt
(i) $1/(s-a)^2+b^2$
(ii) $b/(s-a)^2+b^2$
(iii) $a/(s-a)^2+b^2$
(iv) $ab/(s-a)^2+b^2$

(9) The Laplace transform of $e^{at}t^n$ is given by
(i) $\frac{n!}{S^{n+1}}$
(ii) $\frac{n!}{(S-a)^{n+1}}$
(iii) $\frac{\Gamma(n+1)}{S^{n+1}}$
(iv) None of the above

(10) Laplace transform of cosat
(i) s/s^2+a^2
(ii) s/s^2-a^2
(iii) a/s^2+a^2
(iv) as/s^2+a^2

Q2: Fill in the blanks. (04)

1. The example of even signal is ----------------------.
2. In case of Hartley oscillator, tapped __________is used.
3. Cos n π = -------------.
4. The The Laplace transform of e^{at} ----------------------.

Q2: True or False. (04)

1. A C.T. signal is also called digital signal

2. The unit for attenuation is Decibels.
3. A function f(x) is even if f(-x)=f(x).
4. The numerical value of $\Gamma 1/2$ is $\sqrt{\pi}$.

Q.3 Answer any ten questions briefly. (20)

1. Define a signal.
2. Define Power signal and Energy signal.
3. Draw diagram showing different characteristics of a pulse.
4. What are the important blocks of signal generator? Give function of any one block?
5. What is function of PAD in piston type attenuator?
6. Define Attenuator.
7. Give expressions for a_o, a_n and b_n.
8. Find a_0 for the function $f(x) = x+x^2$ in the fourier series for the interval $-\pi < x < \pi$.
9. Differentiate even and odd functions.
10. Find Laplace transform of $(\text{Sin } t - \text{Cos } t)^2$.
11. Find Laplace transform of $1+ 2\sqrt{t} + \frac{3}{\sqrt{t}}$
12. Find Laplace transform of cos(at+b)

Q.4 **Long Answer question. (Answer any 4 out of 8)** (32)

1. Show classification of signals and describe in detail any three types of signals.
2. Explain in detail pulse characteristics and terminology with neat diagram.
3. Derive an expression for resistors R1, R2 and R3 in Pi attenuator if the decibel attenuation is 10 log N.
4. Explain in detail working of function generator.
5. Find the fourier series expansion of $f(x) = e^{-ax}$ in the interval $-\pi < x < \pi$.
6. Find the fourier series expansion of $f(x) = e^{-x}$ in the interval $0 < x < 2\pi$
7. Find Laplace transform of (i) $e^{-3t} \text{ Sin } 5t \text{ Sin } 3t$ (ii) $t^2 \text{ Sin } at$
8. Find Laplace transform of (i) $t\, e^{2t}\text{Sin}3t$ (ii) $\frac{Cosat - Cosbt}{t}$

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