

## UNIT- IV

### RANDOM PROCESSES-SPECTRAL CHARACTERISTICS

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#### MULTIPLE CHOICE QUESTIONS:

1. The PSD of the random process  $X(t)$  with mean=1 and  $R_{xx}(\tau)=1+e^{-a|\tau|}$  is
  - a.)  $2a/(a^2+\omega^2)$
  - b.)  $1+2a/(a^2+\omega^2)$
  - c.)  $\delta(\omega)+2a/(a^2+\omega^2)$
  - d.)  $\delta(\omega-\omega_0)+2a/(a^2+\omega^2)$
2. the PSD of a random process whose auto correlation function is  $a \cdot e^{-b|\tau|}$  is
  - a.)  $a/(a^2+\omega^2)$
  - b.)  $2ab/(a^2+\omega^2)$
  - c.)  $2a/b(a^2+\omega^2)$
  - d.)  $2a/(a^2+\omega^2)$
3. The auto correlation function of a process with PSD of  $4/(1+0.25\omega^2)$ 
  - a.)  $4 \cdot \exp(-|\tau|)$
  - b.)  $\exp(-|\tau|)$
  - c.)  $4 \cdot \exp(-2|\tau|)$
  - d.) 1
4. PSD of a WSS is always
  - a.) Negative
  - b.) Non-negative
  - c.) Positive
  - d.) Can be negative or positive
5. The mean square value of a random process whose auto correlation function is  $\eta/4RC$ 
  - a.)  $\eta/4$
  - b.)  $\eta/4RC$
  - c.)  $\eta\tau/4RC$
  - d.)  $\eta|\tau|/4RC$
6. The random process  $X(t)$  and  $Y(t)$  are having their auto correlation functions as  $e^{-2|\tau|}$  and  $e^{-3|\tau|}$  respectively. If they are orthogonal processes, then mean square value of  $X(t) + Y(t)$  is
  - a.) 2
  - b.) 3
  - c.) 5
  - d.) 6
7.  $X(t)$  is a random process with mean 'k' and auto correlation function  $R_{xx}(\tau) = 12 + 4 \cdot e^{-0.2|\tau|}$ . The variance of the random variable  $X(5)$  is
  - a.)  $(4+k)^2$
  - b.)  $(4-k)^2$
  - c.)  $16-k^2$

- d.)  $(4+k)/(4-k)$
8. The cross spectral density of two random processes  $X(t)$  and  $Y(t)$  is  $S_{XY}(\omega) = a + j\omega/k$ . The area enclosed by their auto correlation function is
- $a/k$
  - $a$
  - $ka$
  - $a+1/k$
9. The auto correlation function of a WSS random process  $X(t)$  is  $R_{XX}(\tau) = 4 + 2e^{-2|\tau|}$ . The area enclosed by the PSD curve of  $X(t)$  is
- 6
  - 2
  - 8
  - 4
10. The mean of two independent, WSS processes  $X(t)$  and  $Y(t)$  are 2 and 3 respectively. Their cross spectral density is
- $6\delta(\omega)$
  - $12\pi\delta(\omega)$
  - $5\pi\delta(\omega)$
  - $\delta(\omega)$
11. For a periodic signal \_\_\_\_\_ is used for the study of its spectral behavior.
- Fourier series
  - Fourier transform
  - Z-transform
  - None
12. For a non-periodic signal \_\_\_\_\_ is used for the study of its spectral behavior.
- Fourier series
  - Fourier transform
  - Z-transform
  - None
13. Parseval's theorem for energy signals is given by  $E =$  \_\_\_\_\_
- $\int_{-\infty}^{\infty} x(t) dt$
  - $\int_{-\infty}^{\infty} x^3(t) dt$
  - $\int_{-\infty}^{\infty} x^2(t) dt$
  - None
14. The average of auto correlation function and the power spectral density form a \_\_\_\_\_
- Fourier series pair
  - Fourier transform pair
  - Both
  - None
15.  $S_{XX}(\omega) =$  \_\_\_\_\_
- $\int_{-\infty}^{\infty} R_{XX}(\tau) e^{j\omega\tau} d\tau$
  - $\int_{-\infty}^{\infty} R_{XX}(\tau) e^{-j\omega\tau} d\omega$

- c.)  $-\infty \int^{\infty} R_{XX}(\tau) \cdot e^{-j\omega\tau} d\tau$   
d.) None
16.  $R_{XX}(\tau) =$  \_\_\_\_\_  
a.)  $-\infty \int^{\infty} S_{XX}(\omega) \cdot e^{j\omega\tau} d\omega$   
b.)  $-\infty \int^{\infty} S_{XX}(\omega) \cdot e^{-j\omega\tau} d\omega$   
c.)  $1/2\pi \cdot -\infty \int^{\infty} S_{XX}(\omega) \cdot e^{-j\omega\tau} d\omega$   
d.)  $1/2\pi \cdot -\infty \int^{\infty} S_{XX}(\omega) \cdot e^{j\omega\tau} d\omega$
17. The curve  $S_{XX}(\omega)/A$  always encloses \_\_\_\_\_ area  
a.) Double  
b.) Unit  
c.) Triple  
d.) None
18.  $S_{XY}(\omega) = 0$  if  $X(t)$  and  $Y(t)$  are \_\_\_\_\_  
a.) Orthogonal  
b.) Parallel  
c.) Vertical  
d.) None
19. A random process  $n(t)$  is called white noise if its power spectral density is \_\_\_\_\_ over the entire frequency range  
a.) Non-uniform  
b.) Uniform  
c.) Both  
d.) None
20.  $FT[R_{XX}(\tau)] = S_{XX}'(\omega)$  this is called \_\_\_\_\_ relation  
a.) Density Parseval's  
b.) function  
c.) Wiener-khintchine  
d.) None

## ANSWERS:

1. c	2. b	3. c	4. b	5. b
6. a	7. c	8. a	9. a	10. b
11. a	12. b	13. c	14. b	15. c
16. d	17. b	18. a	19. b	20. c

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