Chettinad College of Engineering & Technology
Approved by AICTE, New Delhi and Affiliated to Anna University, Chennai.

Department of Electronics and Communication Engineering

MA 8451 – Probability and Random Processes

Unit III - MCQ Bank

1. A random process X(t) is said to be --------in the strict sense, if its statistical characteristics do not change with time.

A .Ergodic

B. Stationary

C. Wide sense

D. Evolutionary

Answer: (B)

2. A random process X(t) is said to be --------if its mean is constant and its autocorrelation depends only on time difference.

A .Ergodic

B. Stationary

C. Wide sense

D. Evolutionary

Answer: (C)

3. A random process X(t) is called --------if its ensemble averages are equal to appropriate time averages.

A .Ergodic

B. Stationary

C. Wide sense

D. Evolutionary

Answer: (A)

4. In a random process X(s,t),if t is fixed then X(s,t) is a

A. Number

B. Random Variable

C. Single time function

D. Time functions

Answer: (B)

5. The Four types of random process are

A. Discrete Random Sequence

B. Discrete Random Process

C. Continuous Random Sequence

D. Continuous Random Process

E. All the above

Answer: (E)

6. An example for a Continuous Random Process is

A. The Maximum temperature at a place in the interval (0,t).

B. The temperature at the end of the n^{th} hour of day.

C. The number of telephone calls received in the interval (0,t).

D. The outcome of a fair die

Answer: (A)

7. The process {X (t): t ∈ T} whose probability distribution, under certain conditions is given by

$$P(X(t) = n) = \frac{(at)^{n-1}}{(1+at)^{n+1}}, \quad n = 1, 2\ldots$$

$$= \frac{at}{1+at}, \quad n = 0 \quad \text{is a}$$

A .Ergodic

B. Stationary

C. Wide sense

D. Evolutionary

Answer: (D)

8. An example for SSS Process is

A. Bernoulli's process

B. Strong sense white noise

C. Weak sense white noise

D. All the above

Answer: (D)

9. An example for WSS process is

A.A random telegraph signal process

B. Random binary transmission process

C. Sinusoid with random phase

D. All the above

Answer: (D)

10. At the receiver of an AM radio, the received signal containing cosine carrier signal at the carrier frequency ω with a random phase θ that is uniformly distributed over $(0,2\pi)$. The receiver carrier signal is $X(t) = A\cos(\omega t + \theta)$.The Random process X(t) is

A .Ergodic

B. Stationary

C. Wide sense

D. Evolutionary

Answer: (C)

11. The process $X(t) = A\cos\lambda t + B\sin\lambda t$ (where A and B are rvs) and (i) $E(A) = E(B) = 0$ (ii) $E(A^2) = E(B^2) = k$ and (iii) $E(AB) = 0$. The Random process X(t) is

A .Ergodic

B. Stationary

C. Wide sense

D. Evolutionary

Answer: (C)

12. Consider a Markov chain with two states and with the transition matrix P = $\begin{pmatrix} 3/4 & 1/4 \\ 1/2 & 1/2 \end{pmatrix}$ Find the steady state probability of the chain.

A. $(\frac{2}{3}\ \frac{1}{3})$

B. $(\frac{1}{3}\ \frac{1}{3})$

C. $(\frac{2}{3}\ \frac{2}{3})$

D. $(\frac{1}{3}\ \frac{1}{2})$

Answer: (A)

13. The Chapman-Kolmogorov Theorem is(If P is the TPM of a homogeneous Markov chain)

A. $\left[{p_{ij}}^{n}\right] = [p_{ij}]^{n}$

B. $\left[p_{ij}\quad\right] = [p_{ij}]^{n}$

C. $\left[{p_{ij}}^{n}\right] = [p_{ji}]^{n}$

D. $\left[{p_{ji}}^{n}\right] = [p_{ij}]^{n}$

Answer: (A)

14 A stochastic matrix P is said to be regular matrix if all the entries of p^{m}(for some positive integer) are—

A. Negative

B. Zero

C. Positive

D. Infinite

Answer: (C)

15.If ${p_{ij}}^{n} > 0$ for some n for all i and j, then every state can be reached from every other state. When this condition is satisfied, the Markov chain is said to be

A. Reducible

B. Irreducible

C. Both A and B

Answer: (B)

16. The state i of a Markov chain is called a return state if ${p_{ij}}^n$

A. < 0 for some $n \geq 1$

B. > 0 for some $n \geq 1$

C. > 0 for some $n > 1$

D. < 0 for some $n < 1$

Answer: (B)

17. The period d_i of a return state 'i' is defined as the ----- of all m such that ${p_{ij}}^n > 0$.

A.LCM

B. Product

C. Sum

D.GCD

Answer: (D)

18. In Markov Process, Ergodic state is

A. Non-null persistent

B. aperiodic

C. Both A and B

Answer: (C)

19. A state 'i' is called an absorbing state if and only if

A. p_{ij}=1

B. p_{ij}=0

C. p_{ij}>0

D. Both A and B for $i \neq j$

Answer: (D)

20. If the initial state probability distribution of a Markov Chain is $P^{(o)}$=(5/6,1/6) and the TPM of the chain is $\begin{pmatrix} 0 & 1 \\ 1/2 & 1/2 \end{pmatrix}$,find the probability distribution of the chain after 2 steps.

A.$(\frac{11}{24}, \frac{13}{24})$

B.$(\frac{10}{24}, \frac{13}{24})$

C.$(\frac{11}{24}, \frac{10}{24})$

D.$(\frac{13}{24}, \frac{10}{24})$

Answer: (A)

21. A man either drives a car or catches a train to go to office each day. He never goes two days in a row by train but if he drives one day, then the next day he is just as likely to drive again as he is to travel by train. Now suppose that on the first day of the week, the man tossed a fair die and drove to work if and only if a 6 appeared. Find the TPM of the Markov chain.

A. $\begin{pmatrix} 1 & 0 \\ 1/2 & 1/2 \end{pmatrix}$

B. $\begin{pmatrix} 0 & 1 \\ \frac{1}{2} & \frac{1}{2} \end{pmatrix}$

C. $\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$

D. $\begin{pmatrix} 0 & 1 \\ 1/2 & 0 \end{pmatrix}$

Answer: (B)

22. The properties of a Poisson Process is

A. The Poisson Process possess the Markov Process

B. Sum of two independent Poisson processes is a Poisson process

C. Difference of two independent Poisson processes is not a Poisson process

D. All the above

Answer: (D)

23. Suppose that customers arrive at a bank according to a Poisson process with a mean rate of 3 per minute; find the probability that during a time interval of 2 min exactly 4 customers arrive.

A.0.1339

B.1.339

C.0.01339

D.0

Answer: (A)

24. A radioactive source emits particles at a rate of 5 per minute in accordance with Poisson process. Each particle emitted has a probability 0.6 of being recorded. Find the probability that 10 particles are recorded in 4 minutes period.

A.1.048

B.0.1048

C.0.01048

D.1

Answer: (B)

25. The Random telegraph signal process is a

A.WSS

B. Covariance Stationary Process

C. Both A and B

Answer: (C)