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Dept of Electronics and Telecommunication Engineering

Sub: Digital Communication (R-2016) Sem – V

Subject code: ECC 502

1. Which of the following statements are correct for probability mass function, $f(x) = P(X = x)$, of a discrete random variable X has the following properties:

a) All probabilities are positive: $fx(x) \geq 0$.

b) Any event in the distribution has a probability of happening of between 0 and 1 (e.g. 0% and 100%).

c) The sum of all probabilities is 100% (i.e. 1 as a decimal): $\Sigma fx(x) = 1$.

i) a and b

ii) b and c

iii) a, b and c

iv) None of the above

2. In probability theories, the events which can never occur together are classified as

i) collectively exclusive events

ii) mutually exhaustive events

iii) mutually exclusive events

iv) collectively exhaustive events

3. Let X be a random variable with probability distribution function f (x)=0.2 for $|x|<1$
= 0.1 for $1 < |x| < 4$
= 0 otherwise
The probability P ($0.5 < x < 5$) is _____
i) 0.3
ii) 0.5
iii) 0.4
iv) 0.8

4. Variance of a random variable X is given by _____

a) E(X)

b) $E(X^2)$

c) $E(X^2) – (E(X))^2$

d) $(E(X))^2$

5. For random process X = 6 and Rxx (t, t+t) = 36 + 25 exp(|t|). Consider following statements:

(i) X(t) is first order stationary.

(ii) X(t) has total average power of 36 W.

(iii) X(t) is a wide sense stationary.

(iv) X(t) has a periodic component.

Which of the following is true?

a) 1, 2, and 4

b) 2, 3, and 4

c) 2 and 3

d) only 3

6. A random process is defined by X(t) + A where A is continuous random variable uniformly distributed on

(0,1). The auto correlation function and mean of the process is

a) 1/2 & 1/3

b) 1/3 & 1/2

c) 1 & 1/2

d) 1/2 & 1

7. According to Shannon Hartley theorem on channel capacity

(a) $C/B = \log_2(1+S/N)$

(b) $C/B = \log_2(1+S/N_0)$

(c) $C/B = \log_{10}(1+S/N)$

(d) $C/B = \log^{10}(1+S/N^0)$

8. Relation between probability P_k and Information I_k is

(a) $I_k=\log_{10}(1/P_k)$

(b) $I_k=\log_2(1/P_k)$

(c) $I_k=10\log_2(1/P_k)$

(d) $I_k=10\log10(1/P_k)$

9. Shannon's theorem on channel capacity

(a) $R \leq C$

(b) $R \geq C$

(c) $R = C$

(d) $R \times C$

10. Given below is a parity check matrix of a linear block code.

$$H = \begin{matrix} 1 & 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 0 & 1 & 1 & 0 \\ 0 & 1 & 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 0 & 0 \end{matrix}$$

This corresponds to a
i)(6,3) linear block code
ii)(6,4) linear block code
iii)(6,2) linear block code
iv) (2,6) linear block code

11. How error detection and correction is done?
a) By passing it through equalizer
b) By passing it through filter
c) By amplifying it
d) By adding redundancy bits

12. A cyclic code can be generated using
a) Generator polynomial
b) Generator matrix
c) Generator polynomial & matrix
d) None of the mentioned

13. The number of k bit shift over which a single information bit influences the encoder output is given by
a) Code rate
b) Constraint length
c) Code length
d) Code weight

14. The error correcting capability of a code scheme increases as the
a) Number of channel symbols per information bit increases
b) Bandwidth increases

c) Information per bit increases
d) All of the mentioned

15. Which is called as on-off keying?
a) Amplitude shift keying
b) Uni-polar PAM
c) Amplitude shift keying & Uni-polar PAM
d) FSK

16. Which has same probability of error?
a) BPSK and QPSK
b) BPSK and ASK
c) BPSK and PAM
d) BPSK and QAM

17. Which statements are false

a) Binary phase shift keying is a straightforward modulation scheme that can transfer two bits per symbol.

b) Quadrature phase shift keying is more complex but doubles the data rate (or achieves the same data rate with half the bandwidth).

c) QPSK has the same Bandwidth as that of BPSK.

d) Differential QPSK uses the phase difference between adjacent symbols to avoid problems associated with a lack of phase synchronization between the transmitter and receiver.

i)a, b, c and d

ii) b,c and d

iii) a and c

iv) All of the above

18. In which system, bit stream is portioned into even and odd stream?
a) BPSK
b) MSK

c) QPSK
d) FSK

19. The limit which represents the threshold Eb/N0 value below which reliable communication cannot be maintained is called as
a) Probability limit
b) Error limit
c) Shannon limit
d) Communication limit

20. The non coherent FSK needs _____ Eb/N0 than coherent FSK.
a) 1db more
b) 1db less
c) 3db more
d) 3db less

21. A Gaussian distribution into the non linear envelope detector yields
a) Rayleigh distribution
b) Normal distribution
c) Poisson distribution
d) Binary distribution

22. **The process of converting coded output into electrical pulses or waveforms for transmission is called**
(a) Line coding
(b) Amplitude modulation
(c) FSK
(d) Filtering

23. **In a uni-polar RZ format,**
(a) The waveform has zero value for symbol '0'
(b) The waveform has A volts for symbol '0'
(c) The waveform has positive and negative values for '1' and '0' symbol respectively
(d) The waveform has - A volts for symbol '0'

24. Matched filters characteristic is
(a) To maximize Signal to noise ratio even for non-Gaussian noise
(b) It gives the output as signal energy in the presence of noise
(c) They are used for signal amplification.
(d) None of the above

25. Matched filters may be used
To estimate the frequency of the received signal
In parameter de-estimation problems
To calculate the distance of the object
To filter the noise