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| **Course/Branch** : B.E/ECE | **Year / Semester** : III / V | Format No. | NAC/TLP-07a.13 |
| **Subject Code** : EC8501 | **Subject Name** : Digital Communication | Rev. No. | 02 |
| **Unit No** : 1 | **Unit Name** : Information Theory | Date | 30.09.2020 |

**OBJECTIVE TYPE QUESTION BANK**

| S. No. | Objective Questions (MCQ /True or False / Fill up with Choices ) | BTL |
|---|---|---|
| 1 | Entropy is<br><br>**a. Average information per message**<br>b. Information in a signal<br>c. Amplitude of signal<br>d. All of the above | L2 |
| 2 | The information I contained in a message with probability of occurrence is given by (k is constant).<br><br>**a. I = k $\log_2 1/P$**<br>b. I = k $\log_2 P$<br>c. I = k $\log_2 1/2P$<br>d. I = k $\log_2 1/P^2$ | L2 |
| 3 | The expected information contained in a message is called<br><br>**a. Entropy**<br>b. Efficiency<br>c. Coded signal<br>d. None of the above | L4 |
| 4 | The mutual information<br><br>a. Is symmetric<br>b. Always non negative<br>**c. Both are correct**<br>d. None of the above | L5 |
| 5 | The relation between entropy and mutual information is<br><br>**a. I(X;Y) = H(X) – H(X/Y)**<br>b. I(X;Y) = H(X/Y) – H(Y/X)<br>c. I(X;Y) = H(X) – H(Y)<br>d. I(X;Y) = H(Y) – H(X) | L1 |
| 6 | Information rate is defined as<br><br>a. Information per unit time<br>b. Average number of bits of information per second<br>c. rH<br>**d. All of the above** | L1 |
| 7 | The memory less source refers to.<br><br>a. No previous information<br>b. No message storage | L2 |

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| | **c. Emitted message is independent of previous message**<br>d. None of the above | |
| 8 | The technique that may be used to increase average information per bit is.<br><br>**a. Shannon-Fano algorithm**<br>b. ASK<br>c. FSK<br>d. Digital modulation techniques | L1 |
| 9 | Code rate r, k information bits and n as total bits, is defined as<br><br>**a. r = k/n**<br>b. k = n/r<br>c. r = k * n<br>d. n = r * k | L1 |
| 10 | The information rate R for given average information H= 2.0 for analog signal band limited to B Hz is<br><br>a. 8 B bits/sec<br>**b. 4 B bits/sec**<br>c. 2 B bits/sec<br>d. 16 B bits/sec | L3 |
| 11 | For a binary symmetric channel, the random bits are given as<br><br>**a. Logic 1 given by probability P and logic 0 by (1-P)**<br>b. Logic 1 given by probability 1-P and logic 0 by P<br>c. Logic 1 given by probability $P^2$ and logic 0 by 1-P<br>d. Logic 1 given by probability P and logic 0 by $(1-P)^2$ | L2 |
| 12 | The probability density function of a Markov process is<br><br>**a. p(x1,x2,x3…….xn) = p(x1)p(x2/x1)p(x3/x2)…….p(xn/xn-1)**<br>b. p(x1,x2,x3…….xn) = p(x1)p(x1/x2)p(x2/x3)…….p(xn-1/xn)<br>c. p(x1,x2,x3……xn) = p(x1)p(x2)p(x3)…….p(xn)<br>d. p(x1,x2,x3……xn) = p(x1)p(x2 * x1)p(x3 * x2)……..p(xn * xn-1) | L3 |
| 13 | The capacity of Gaussian channel is<br><br>a. C = 2B(1+S/N) bits/s<br>b. $C = B^2(1+S/N)$ bits/s<br>**c. C = B(1+S/N) bits/s**<br>d. C = B(1+S/N)2 bits/s | L1 |
| 14 | For M equally likely messages, the average amount of information H is<br><br>a. $H = \log_{10}M$<br>**b. $H = \log_2 M$** | L1 |

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| | c. $H = \log_{10}M^2$<br>d. $H = 2\log_{10}M$ | |
| 15 | The channel capacity is<br>**a. The maximum information transmitted by one symbol over the channel**<br>b. Information contained in a signal<br>c. The amplitude of the modulated signal<br>d. All of the above | L2 |
| 16 | The capacity of a binary symmetric channel, given H(P) is binary entropy function is<br>**a. 1 – H(P)**<br>b. H(P) – 1<br>c. $1 – H(P)^2$<br>d. $H(P)^2 – 1$ | L3 |
| 17 | According to Shannon Hartley theorem,<br>a. The channel capacity becomes infinite with infinite bandwidth<br>b. The channel capacity does not become infinite with infinite bandwidth<br>c. Has a tradeoff between bandwidth and Signal to noise ratio<br>**d. Both b and c are correct** | L1 |
| 18 | The negative statement for Shannon's theorem states that<br>**a. If R > C, the error probability increases towards Unity**<br>b. If R < C, the error probability is very small<br>c. Both a & b<br>d. None of the above | L5 |
| 19 | For M equally likely messages, M>>1, if the rate of information R ≤ C, the probability of error is<br>**a. Arbitrarily small**<br>b. Close to unity<br>c. Not predictable<br>d. Unknown | L1 |
| 20 | For M equally likely messages, M>>1, if the rate of information R > C, the probability of error is<br>a. Arbitrarily small<br>**b. Close to unity**<br>c. Not predictable<br>d. Unknown | L1 |
| 21 | The prefix code is also known as<br>**a. Instantaneous code**<br>b. Block code | L2 |

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| | c. Convolutional code<br>d. Parity bit | |
| 22 | Self information should be<br>**a) Positive**<br>b) Negative<br>c) Positive & Negative<br>d) None of the mentioned | L1 |
| 23 | The unit of average mutual information is<br>**a) Bits**<br>b) Bytes<br>c) Bits per symbol<br>d) Bytes per symbol | L1 |
| 24 | Binary Huffman coding is a<br>**a) Prefix condition code**<br>b) Suffix condition code<br>c) Prefix & Suffix condition code<br>d) None of the mentioned | L3 |
| 25 | The method of converting a word to stream of bits is called as<br>a) Binary coding<br>**b) Source coding**<br>c) Bit coding<br>d) Cipher coding | L2 |
| 26 | When the base of the logarithm is 2, then the unit of measure of information is<br>**a) Bits**<br>b) Bytes<br>c) Nats<br>d) None of the mentioned | L2 |
| 27 | When X and Y are statistically independent, then I (x,y) is<br>a) 1<br>**b) 0**<br>c) Ln 2<br>d) Cannot be determined | L5 |

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| 28 | The self information of random variable is<br><br>a) 0<br>b) 1<br>**c) Infinite**<br>d) Cannot be determined | L2 |
| 29 | Entropy of a random variable is<br><br>a) 0<br>b) 1<br>**c) Infinite**<br>d) Cannot be determined | L1 |
| 30 | Lempel-Ziv algorithm is<br><br>**a) Variable to fixed length algorithm**<br>b) Fixed to variable length algorithm<br>c) Fixed to fixed length algorithm<br>d) Variable to variable length algorithm | L1 |
| 31 | Coded system are inherently capable of better transmission efficiency than the uncoded system.<br><br>**a) True**<br>b) False | L1 |