2128

Sr. No. 2959

B.E. (IT) 3rd Semester

IT-313: COMMUNICATION THEORY

Time allowed: 3 hours   Max. Marks: 100

Note: Attempt any five questions, selecting at least two questions from each of Part A and Part B.

Part A

Q1. Draw the full Wave rectified waveform f(t) = cos (t), find A, B, C, D in the expression: [20]

$$f(t) = A[1 + B \cos 2t - C \cos 4t + D \cos 6t + ,………]$$

use : $\sin\{(2n - 1)\pi/2\} = (-1)^{n+1}$ and $\sin\{(2n + 1) \pi /2\} = (-1)^{n}$

Q2. For the exponential function $p(x) = a [\exp(-b | x |)]$,   b>0.   [20]
Determine:

1.   Draw the function   2.   First moment
2.   Second moment   3.   Variance Distribution
4.   Function relation between a and b for which p(x) is realizable.

Q3(a) An ideal low pass filter is given by: [10+10]

$$H_1(\omega) = K e^{-j\omega to} \qquad |\omega| \leq \omega c$$
$$= 0 \qquad |\omega| > \omega c$$

Find the impulse response of its equivalent bandpass filter.

(b) Discuss Optimum Filters.

Q4. (a) Determine the Fourier Transform of single r.f pulse, given by: [10+10]

$$f(t) = V \cos w_c t \qquad -\tau/2 \leq t \leq \tau/2$$
$$= 0 \qquad \text{elsewhere}$$

(b) What is the expectation value of sum of not necessarily statistically independent random variables?
Find the variance of sum of two random variables x and y. What will be the result if these random variables are statistically independent?

Part B

Q5(a) Derive an expression for noise figure of cascaded networks. Prove that the noise figure of the first stage has maximum contribution and contribution by the subsequent stages reduces.

(b) What is Interference? List the various types of noises present in Semiconductor Diodes and Transistors. Explain Thermal noise in detail.   [10+10]
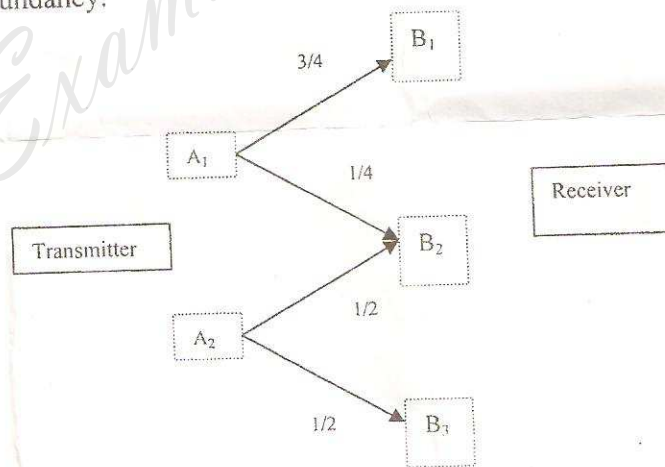
Q6(a). Explain Shot Noise in detail.

(b) Prove that for entropy to be maximum all messages should be equally likely and that the maximum value of entropy is logarithmic of number of messages.   [10+10]

Q7(a). Apply Shannon-Fano coding. Given M=2

[X] =	x_1	x_2	x_3	x_4	x_5	x_6	x_7
[P]=	1/4	1/16	1/16	1/16	1/8	1/4	1/8

Find average length of code words, efficiency and redundancy.

(b) For the channel given, find I (X,Y)
$$P(A_1) = P(A_2) = \tfrac{1}{2}$$

Transmitter

A$_1$ →(3/4)→ B$_1$
A$_1$ →(1/4)→ B$_2$
A$_2$ →(1/2)→ B$_2$
A$_2$ →(1/2)→ B$_3$

Receiver

Q8(a). What type of probability density gives maximum entropy if the variance of x about m_1 is σ^2? Also find this maximum value of entropy.   [20]

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20 + 20 + 10 + 10 + 10 + 2·5 +

77·5