Q.2 a. State Shannon Hartley law. What are it's implications.
Answer: Page Number 175-176 of Text Book I

Q.3 a. Show that the mutual information is always non-negative and we cannot lose information by observing the output of a channel.
Answer: Page Number 33 of Text Book II

b. What is binary symmetric channel? Find the rate of information transmission over this channel.
Answer: Page Number 168-169 of Text Book I

Q.4 a. Discuss how would you compute the entropy and information rate of Mark-off source.
Answer: Page Number 150-151 of Text Book I

b. Explain measure of information and derive expression for it?
Answer: Page Number 140-141 of Text Book I

c. Find the entropy of a source that emits one of three symbols A, B, and C in a statistically independent sequence with probabilities $\frac{1}{2}$, $\frac{1}{4}$ and $\frac{1}{4}$ respectively.
Answer: Page Number 144 of Text Book I

Q.5 a. Give the different properties of entropy of zero memory source.
Answer: Page Number 18 of Text Book II

b. Design a source encoder for the information source given in fig.1 compare the average output bit rate and efficiency of the coder for N = 1, 2 and 3.
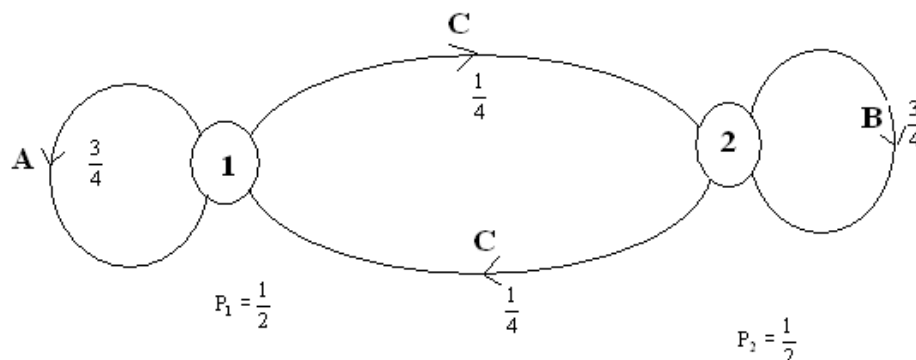

Fig.1

Answer: Page Number 159-160 of Text Book I

Q.6 a. Draw and explain relationships involving joint, marginal and conditional probabilities.

Answer: Page Number 73-74 of Text Book I

b. Binary data are transmitted over a noisy communication channel in blocks of 16 binary digits. The probability that a received binary digit is in error due to channel noise is 0.1. Assume that the occurrence of an error in a particular digit does not influence the probability of occurrence of an error in any other digit within the block (i.e., errors occur in various digit positions within a block in a statistically independent fashion).
(ii) Find the variance of the number of errors per block.
(iii) Find the probability that the number of errors per block is greater than or equal to 5.

Answer: Page Number 78-79 of Text Book I

Q.7 a. Compare uniform pdf and Gaussian pdf.

Answer: Page Number 80-81 of Text Book I

b. Define stationarity, Time Averages and Ergodicity.

Answer: Page Number 90-91 of Text Book I

Q.8 a. Prove that all the 2^k n- tuples of a co-set have the same syndrome and the syndromes of different co-sets are different.

Answer: Page Number 460 of Text Book I

Text Book

1. Digital and Analog Communication Systems by K. Sam Shanmugam, John Wiley India Edition, 2007 reprint.

2. Digital Communications by Simon Haykin, John Wiley & Sons, Student Edition.