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Registration Number :

B.E. / B.Tech. (Full Time) DEGREE ARREAR EXAMINATION – NOV./DEC. 2012

ELECTRONICS AND COMMUNICATION ENGINEERING BRANCH

SEVENTH SEMESTER – (REGULATIONS R 2008)

EC 9027 – INFORMATION THEORY

Duration : 3 Hours

Max. Marks = 100

Answer ALL the questions.

PART- A (10 x 2 = 20 marks)

1. Given a source symbol set { a,b,c,d } with probabilities { 1/2 , 1/4 , 1/8 , 1/8 }, find the source entropy.
2. Define the relative entropy or Kullback Leibler distance between two probability mass functions $p(x)$ and $q(x)$.
3. Consider the code { 0, 01 }. Is it instantaneous ? Is it uniquely decodable ?
4. What are the properties to be satisfied for the existence of Optimal Instantaneous Codes with minimum expected length.
5. Define Discrete Memoryless Channel with an appropriate illustrative model.
6. State the Source-Channel Coding theorem.
7. Determine the Differential entropy of a normally distributed random variable.
8. To allow multiplexing of many channels, telephone signals are band-limited to 3300 Hz. Using a bandwidth of 3300 Hz and a SNR (signal to noise ratio) of 20 dB, find the capacity of the telephone channel.
9. Give the model of a Gaussian broadcast channel.
10. State the converse theorem for the Gaussian Multiple Access Channel.

PART – B (5 x 16 = 80 marks)

11. Differentiate between Binary Symmetric Channels (BSC) and Binary Erasure Channels (BEC). Derive and compare the Capacities of the BSC and the BEC channels.
- 12a. Given $p(x, y)$ as

		Y	
		0	1
X	0	$\frac{1}{3}$	$\frac{1}{6}$
	1	0	$\frac{1}{6}$

1/2