

Department of Electronics & Communication Engineering

Faculty of Engineering, Integral University, Lucknow

Surprise Test-2

Information Theory & Coding (EC-031)

Time : 50 Minutes

Attempt any three problems.

1.

A source emits one of four symbols $s_0, s_1, s_2,$ and s_3 with probabilities $1/3, 1/6, 1/4,$ and $1/4,$ respectively. The successive symbols emitted by the source are statistically independent. Calculate the entropy of the source.

2.

Alphanumeric data are entered into a computer from a remote terminal through a voice-grade telephone channel. The channel has a bandwidth of 3.4 kHz and output signal-to-noise ratio of 20 dB. The terminal has a total of 128 symbols. Assume that the symbols are equiprobable and the successive transmissions are statistically independent.

(a) Calculate the information capacity of the channel.

(b) Calculate the maximum symbol rate for which error-free transmission over the channel is possible.

3.

A voice-grade channel of the telephone network has a bandwidth of 3.4 kHz.

(a) Calculate the information capacity of the telephone channel for a signal-to-noise ratio of 30 dB.

(b) Calculate the minimum signal-to-noise ratio required to support information transmission through the telephone channel at the rate of 9,600 b/s.

4. A source emits one of the four possible symbols' during each signaling intervals. The symbols occur with the probabilities

$$P_0 = 0.4$$

$$P_1 = 0.3$$

$$P_2 = 0.2$$

$$P_3 = 0.1$$

Find Amount of information gained by observing the source emitting each of these symbols.