**Prasad V Potluri Siddhartha Institute of Technology**

**(Autonomous)**

Kanuru, Vijayawada-07

II B.Tech(Computer Science and Engineering) -I Sem

**(CS3T5) Information Theory - Model Paper**

Max Time: 3 hrs Max Marks: 70M

Answer any five of the following

1. a) What is **Entropy**? State their **properties** and give an **example**. **5M**

b) Define **Joint Entropy** H(X, Y) and **Mutual Information** I(X, Y). **4M**

c) Prove the **relationship between** Entropy and Mutual Information. **5M**

1. a) A discrete Memory less source has an alphabet of 5 symbols whose probabilities of

occurrences are as described here

Symbols : s0 s1 s2 s3 s4

Probabilities : 0.4 0.2 0.2 0.1 0.1

Compute the **Huffman code** for this source, entropy and the average codeword length of the

source encoder.

**7M**

b) Explain **Shannon – Fano Elias Coding theorem** with an example. **7M**

1. State and Prove the **Channel Coding Theorem**. **14M**
2. a) Define **Differential Entropy** with examples. **7M**

b) What are the properties of **differential entropy, Relative entropy, Mutual Information**? **7M**

1. a) Explain the **Coding Theorem for Gaussian Channels**. **7M**

b) Explain Parallel Gaussian Channels with an example. 7M

1. a) Explain the **Law of Large Numbers**. **7M**

b) State and Prove **Stein’s Lemma. 7M**

1. a) What is **Rate Distortion codes** and **Information Rate Distortion** with an example? **6M**

b) Explain the **converse to the Rate Distortion Theorem**. **8M**

1. a) Briefly explain Various **Gaussian Multiple User Channels. 7M**

b) What is **Rate Distortion Function with side Information** and State and prove the theorem.

**7M**