Paper id: 251019

Roll No: | | | | | | | | | | | | | |

# BTECH
## (SEM VI) THEORY EXAMINATION 2024-25
## DATA COMPRESSION

**TIME: 3 HRS** **M.MARKS: 70**

**Note:** Attempt all Sections. In case of any missing data; choose suitably.

## SECTION A

**1. Attempt *all* questions in brief.** **02 x 7 = 14**

| Q no. | Question | CO | Level |
|---|---|---|---|
| a. | What is data compression? Explain with the help of block diagram. | 1 | K2 |
| b. | What are some real-world applications of data compression? | 1 | K2 |
| c. | What is the principle behind Huffman coding? | 1 | K2 |
| d. | What is the role of the Linde-Buzo-Gray (LBG) algorithm in vector quantization? | 5 | K2 |
| e. | Differentiate between lossless and lossy compression with examples. | 1 | K2 |
| f. | List the distortion criteria commonly used in quantization and explain their importance | 5 | K2 |
| g. | Determine the Golomb code representations of 9 and 13 when m=5. | 1 | K2 |

## SECTION B

**2. Attempt any *three* of the following:** **07 x 3 = 21**

| | | | |
|---|---|---|---|
| a. | A networking company uses a compression technique to encode the message before transmitting over the network. Suppose the message contains the following characters with their frequency:<br>**Character** / **Frequency**<br>**a** 5<br>**b** 9<br>**c** 12<br>**d** 13<br>**e** 16<br>**f** 45<br>Note that each character in input message takes 1 byte. If the compression technique used is Huffman Coding, how many bits will be saved in the message? | 2 | K2 |
| b. | What is a Golomb code? How is it different from Rice code? | 1 | K2 |
| c. | Describe the function of the Burrows-Wheeler Transform in compression. | 4 | K2 |
| d. | What are the key elements of the quantization problem? | 5 | K2 |
| e. | What is the role of the Linde-Buzo-Gray (LBG) algorithm in vector quantization? | 5 | K2 |

## SECTION C

**3. Attempt any *one* part of the following:** **07 x 1 = 07**

| | | | |
|---|---|---|---|
| a. | Differentiate between LZ77 and LZ78 dictionary compression approaches. | 3 | K2 |
| b. | Write a short note on:<br>i. Compression Standards<br>ii. Prediction by Partial Matching (PPM)<br>iii. Burrows-Wheeler Transform (BWT)<br>iv. Audio Compression<br>v. Markov Model | 1 | K2 |

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**4. Attempt any *one* part of the following: 07 x 1 = 07**

| | | | |
|---|---|---|---|
| a. | Encode the string **"ABABABA"** using LZW compression. Assume the initial dictionary contains all single uppercase letters **(A–Z)** with ASCII values **(A=65, B=66, ...)**. Provide the output code sequence. | 1 | K2 |
| b. | Write a short note on:<br>i. Entropy<br>ii. Compression Ratio<br>iii. Prefix Code<br>iv. Run-Length Encoding (RLE)<br>v. Signal-to-Noise Ratio (SNR) | 1 | K2 |

**5. Attempt any *one* part of the following: 07 x 1 = 07**

| | | | |
|---|---|---|---|
| a. | Compare Binary coding with Huffman coding and explain their differences in performance. | 2 | K2 |
| b. | Explain the LZ77 and LZ78 approaches and how they are used in UNIX file compression. | 3 | K2 |

**6. Attempt any *one* part of the following: 07 x 1 = 07**

| | | | |
|---|---|---|---|
| a. | Explain the process of scalar quantization and discuss the models used for it. | 4 | K2 |
| b. | Describe the types of quantizers: uniform, adaptive, and non-uniform with examples. | 4 | K2 |

**7. Attempt any *one* part of the following: 07 x 1 = 07**

| | | | |
|---|---|---|---|
| a. | Describe the differences between structured and tree-structured vector quantizers. | 5 | K2 |
| b. | Explain the working of the Linde-Buzo-Gray algorithm for vector quantization. | 4 | K2 |