

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VI (NEW) EXAMINATION – SUMMER 2023****Subject Code:2161603****Date:10-07-2023****Subject Name:Data Compression and data Retrival****Time:10:30 AM TO 01:00 PM****Total Marks:70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

MARKS

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|------------|--|-----------|
| Q.1 | (a) List and explain various performance criteria for measuring the efficiency of compression technique. | 03 |
| | (b) Differentiate the following terms | 04 |
| | a. Lossy and lossless compression | |
| | b. Modeling and coding | |
| | (c) Consider a source with a six-symbol alphabet, $a_1, a_2, a_3, a_4, a_5, a_6$, with probabilities $p_1 = 0.2, p_2 = 0.01, p_3 = 0.35, p_4 = 0.38, p_5 = 0.02, p_6 = 0.04$. a) Find the entropy of this source. | 07 |
| | b) Find a Huffman code for this source. | |
| | c) Compute the expected code length of this Huffman code. | |
| Q.2 | (a) Design a Golomb code for $m = 5$ for numbers 0 to 15. | 03 |
| | (b) Determine whether the following codes are uniquely decodable: | 04 |
| | (a) {0, 01, 11, 111} | |
| | (b) {0, 01, 110, 111} | |
| | (c) {0, 10, 110, 111} | |
| | (d) {1, 10, 110, 111} | |
| | (c) Explain minimum variance huffman coding procedure in detail with an example. | 07 |
| | OR | |
| | (c) Explain encoding of string using adaptive Huffman coding. | 07 |
| Q.3 | (a) Explain the importance of scaling in arithmetic coding. | 03 |
| | (b) Explain prediction with partial match (PPM) | 04 |
| | (c) Explain the procedure of generating the tag value using arithmetic coding. | 07 |
| | OR | |
| Q.3 | (a) Explain the procedure of scaling in arithmetic coding. | 03 |
| | (b) Explain the Burrows-Wheeler Transform (BWT) | 04 |
| | (c) Consider a source with a symbol alphabet {A, B, C} with probabilities $p(A) = 0.2, p(B) = 0.3, p(C) = 0.5$. Generate the tag value for string AACBCA using arithmetic coding procedure. | 07 |
| Q.4 | (a) Explain sampling and quantization in brief. | 03 |
| | (b) Encode the following sequence using the LZ78 approach:
wabba\$bwabba\$bwabba\$bwabba\$bwoo\$bwoo\$bwoo | 04 |
| | (c) Explain the procedure of generating output using LZ77 approach with an example. | 07 |
| | OR | |
| Q.4 | (a) Explain the significance of discrete cosine transform (DCT) in JPEG Compression. | 03 |
| | (b) Assuming that the alphabet for the source is {\$, a, b, o, w} , Encode the following sequence using the LZW approach:
wabba\$bwabba\$bwabba\$bwabba\$bwoo\$bwoo\$bwoo | 04 |

- (c) Explain the procedure of decoding the output of LZ77 approach with an example. **07**
- Q.5** (a) Explain adaptive quantization in brief. **03**
- (b) Explain tree-structured vector quantizers in brief. **04**
- (c) Explain Lemmatization and Stemming in detail. **07**
- OR**
- Q.5** (a) Explain non-uniform quantization in brief. **03**
- (b) Explain the Linde-Buzo-Gray algorithm in brief (LBZ). **04**
- (c) Explain challenges in XML information retrieval **07**
