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Sixth Semester B.E. Degree Examination, Jan./Feb. 2021
Data Compression

Time: 3 hrs.

Max. Marks:100

Note: Answer any FIVE full questions, selecting at least TWO questions from each part.

PART – A

- 1 a. What is data compression? Explain different types of compression techniques. (04 Marks)
- b. Define $i(A)$, the self information associated with an event A. If A and B are independent events, prove that $i(AB) = i(A) + i(B)$. (04 Marks)
- c. Determine whether the following codes are uniquely decodable: (04 Marks)
 - i) {0, 01, 110, 111}
 - ii) {0, 01, 11, 111}
- d. A source emits letters from an alphabet $A = \{a_1, a_2, a_3, a_4, a_5\}$ with $p(a_1) = p(a_3) = 0.2$, $p(a_2) = 0.4$, $p(a_4) = p(a_5) = 0.1$.
 - i) Calculate entropy of the source.
 - ii) Find a Huffman code for this source.
 - iii) Find average length of Huffman code and hence its redundancy. (08 Marks)
- 2 a. Given an initial dictionary consisting of letters entries (a, b, r, y, \backslash) with indices (1, 2, 3, 4, 5). Encode the following message using the LZW algorithm. (08 Marks)
 a \backslash b a r \backslash a r r a y \backslash b y \backslash b a r r a y a r \backslash b a y. (06 Marks)
- b. Explain diagram coding techniques. (06 Marks)
- c. Write a note on JPEG-LS standard. (06 Marks)
- 3 a. Define autocorrelation. Write short note on ARMA (N, M) model. (06 Marks)
- b. Briefly explain the function of a quantizer. Show that for every bit being included in a uniform quantizer of uniformly distributed source, the signal – to – noise ratio increases by 6dB. (10 Marks)
- c. Highlight various distortion criterias used in lossy compression schemes. (04 Marks)
- 4 a. What is a codebook vector? Explain vector quantization procedure with neat diagram. (08 Marks)
- b. Explain Linde-Buzo-Gray algorithm to the case where the inputs are no longer scalars. (06 Marks)
- c. Explain adaptive quantization and prediction in DPCM. (06 Marks)

PART – B

- 5 a. State linear system properties. (04 Marks)
- b. Find the inverse Z-transform of $F(z) = \frac{6z^2 - 9z}{z^2 - 2.5z + 1}$. (06 Marks)
- c. Define sampling theorem. Obtain inverse Fourier transform $f(t)$ in ideal sampling frequency domain view. (10 Marks)
- 6 a. With a neat block diagram, explain in detail. (10 Marks)
- b. With a block diagram, explain MPEG – 2 AAC encoder. (10 Marks)
- 7 a. Explain multi resolution analysis and scaling function, with an example. (10 Marks)
- b. Explain embedded zerotree coder with a neat diagram. (10 Marks)
- 8 a. What is motion compensation? Draw the block diagram of H.261 video coder and illustrate the roles of motion compensation and loop filter. (10 Marks)
- b. Write a note on: i) Model-Based coding technique; ii) Video standard MPEG-2. (10 Marks)

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