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R 3409

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2007.

Fourth Semester

Information Technology

IT 1251 — INFORMATION CODING TECHNIQUES

(Regulation 2004)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. If X represents the out come of a single roll of a fair die. What is the entropy of X?

2. A code is composed of dots and dashes. Assume that dashes three times longer than dot and has one third of probability of occurrence. Calculate average information in the dot-dash code.

3. Why subband coding is preferred for speech coding?

4. What do you mean by slope overload distortion in delta modulation?

5. State two properties of syndrome (used in linear block codes).

6. What do you mean by code rate and constraint length in convolutional code?

7. What is the major advantage of the adaptive Huffman coding over static Huffman coding?

8. Write the formula for quantization which is used in JPEG compression.

9. List the three features which determine the perception of a signal by the ear.

10. Define the terms 'group of pictures' and 'prediction span' with respect to video compression.

PART B — (5 × 16 = 80 marks)

11. (a) An analog signal having 4 kHz bandwidth is sampled at 1.25 times the Nyquist rate, and each sample is quantized into one of 256 equally likely levels. Assume that the successive samples are statistically independent.

   (i) What is the information rate of this source? (6)

   (ii) Can the output of this source be transmitted without error over an AWGN channel with a bandwidth of 10 kHz and an S/N ratio of 20 dB? (5)

   (iii) Find the bandwidth required for an AWGN channel for error-free transmission of the output of this source if the S/N ratio is 25 dB. (5)

Or

   (b) A discrete memoryless source X has five equally likely symbols.

   (i) Construct a Shannon-Fano code for X, and calculate the efficiency of the code. (8)

   (ii) Repeat for the Huffman code and compare the results. (8)

12. (a) With the aid of a schematic diagram, explain the operation of a basic ADPCM. Also, explain how a basic ADPCM scheme obtains improved performance over a DPCM scheme.

Or

   (b) Explain the working principle of delta modulation? State the draw backs of delta modulation and suggest solution.

13. (a) The SEC (7,4) Hamming Code can be converted into a double error detecting and single error correcting (8,4) code by using an extra parity check. Construct the generator matrix for the code and also construct encoder and decoder for the code.

Or

   (b) A convolutional encoder has a single shift register with 2 stages, 3 modulo-2 adders and an output multiplexer. The generator sequences of the encoder are as follows $g_1(x) = (1, 0, 1)$ and $g_2(x) = (1, 1, 0)$ and $g_3(x) = (1, 1, 1)$. Draw (i) the block diagram of the encoder, (ii) state diagram, and also explain the working principle of the encoder.

14. (a) With suitable example briefly explain static Huffman coding and dynamic Huffman coding. Also compare them.

Or

(b) With the aid of a diagram, describe the interlaced mode of operation of GIF and also describe the principles of TIFF.

15. (a) Explain the principles of LPC. Draw the schematic of an LPC encoder and decoder, and identify and explain the perception parameters and associated vocal tract excitation parameters.

Or

(b) State and explain the encoding procedure used with (i) the motion vector and (ii) P and B frame. Draw the necessary sketches.

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