

B.E DEGREE EXAMINATIONS: APRIL/MAY 2011

Sixth Semester

COMPUTER SCIENCE AND ENGINEERING

U07CS602: Information and Coding Techniques

Time: Three Hours

Maximum Marks: 100

Answer ALL Questions:-

PART A (10 x 1 = 10 Marks)

1. Information Rate is _____ .
A) $R = r/H$ B) $R = H/r$ C) $R = rH$ D) $H = R/r$
2. The channel capacity of the discrete memoryless channel is given as _____ average mutual information.
A) Minimum B) Large C) Small D) Maximum.
3. PWM is referred to as _____
A) PPM B) PAM C) PDM D) Flat Top
4. The signal to quantization noise ratio in a PCM system depends on _____
A) Quantization Levels B) Sampling Rate C) Bandwidth D) Quantization Error
5. Constraint length is expressed in terms of _____.
A) Distance B) Bit error rate C) Message Bits D) Polynomial.
6. Block Codes take _____ number of message bit simultaneously and forms _____ bit code vector.
A) $2k, 2n$ B) $k/2, n/2$ C) $n/k, k$ D) n, k
7. TIFF stands for _____.
A) Tagged Image File Format B) Tagged Impression File Format
C) Tagged Image Format File D) Tagged Impression File Formation
8. Runlength encoding is a _____ encoding techniques.
A) Lossy B) Static C) Dynamic D) Lossless
9. Linear Predictive Coding is normally used for _____ compression.
A) Audio B) Video C) Text D) Images
10. MIDI stands for _____.
A) Musical Interface Digital Instrument. B) Medical Interface Digital Instrument
C) Medical Instrument Digital Interface. D) Musical Instrument Digital Interface.

PART B (10 x 2 = 20 Marks)

11. Define mutual information and state its two properties.
12. What is Prefix Coding?
13. What is meant by aliasing effect?
14. What is meant by adaptive delta Modulation?
15. Define free distance and coding gain.
16. What is RS code?
17. What is JPEG standard?
18. State the main application of Graphics Interchange Format?
19. What is Dolby AC -1?
20. What is perceptual Coding?

PART C (5 x 14 = 70 Marks)

21. a) A discrete memoryless source has five symbols x_1, x_2, x_3, x_4 and x_5 with probabilities 0.4, 0.19, 0.16, 0.15 and 0.15 respectively attached to every symbol.
 - (i) Construct a Shannon-Fano code for the source and calculate code efficiency η .
 - (ii) Repeat (i) for Huffman code & compare the two techniques of source coding.

(OR)

- b) 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. Assuming the samples to be statistically independent:
 - (i) What is information rate of this source?
 - (ii) Can the output of this source transmitted without error over an AWGN channel with a bandwidth of 10 kHz and S/N ratio of 20 dB?
 - (iii) Find S/N ratio required for error free transmission of part (ii).
 - (iv) Find the bandwidth required for an AWGN channel for an error free transmission of the output of this source if S/N ratio is 20 dB.

22. a) Discuss the Slope Overload Distortion and Granular Noise associated with Delta Modulation and how it is removed in Adaptive Delta Modulation?

(OR)

- b) Explain Quantization error and derive an expression for maximum signal to noise ratio in PCM system that uses linear quantization.

23. a) A rate $1/3$ convolutional encoder with a constraint length of '3' uses the generating vectors as $g_1 = (100)$, $g_2 = (101)$ and $g_3 = (111)$.

(i) Sketch the encoder configuration and prepare the logic table.

(ii) Draw the state diagram for the coder.

(iii) Determine the d_{free} distance of the coder.

(OR)

b) Construct a systematic (7, 4) cyclic code using the generator polynomial $g(x) = x^3 + x + 1$.

What are the error correcting capabilities of this code? Construct the decoding table and for the received codeword 1101100, determine the transmitted data word.

24. a) (i) Explain Lempel –Viz (ZIP) Coding. (8)

(ii) Differentiate between Lossless and Lossy Compression. (6)

(OR)

b) (i) With the help of block diagrams, explain the working of JPEG encoder and decoders. (8)

(ii) Write a brief note on i) GIF format ii) TIFF format (6)

25. a) (i) With the help of block diagrams explain speech coding using LPC. What is code excited LPC? List the CELP standards. (8)

(ii) Draw the block diagrams and explain Dolby AC -1 audio coders. (6)

(OR)

b) (i) With the help of block diagrams of encoder/decoder, explain MPEG audio perceptual coding. (10)

(ii) Explain MIDI standard. What is its application? (4)
