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**Question Paper Code: 45406**

B.E. / B.Tech. DEGREE EXAMINATION, APRIL 2019

Fifth Semester

Electronics and Communication Engineering

14UEC506 - INFORMATION THEORY AND CODING

(Regulation 2014)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

- Huffman coding technique is adopted for constructing the source code with \_\_\_\_\_ redundancy.  
(a) minimum                      (b) constant                      (c) maximum                      (d) unpredictable
- In channel coding theorem, channel capacity decides the \_\_\_\_\_ permissible rate at which error free transmission is possible.  
(a) maximum                      (b) minimum                      (c) constant                      (d) none of these
- Which among the following compression techniques is/are intended for still images?  
(a) JPEG                      (b) H.263                      (c) MPEG                      (d) All the above
- The bit allocation information mode that is used by the decoder to dequantize the set of sub band samples in a Dolby AC-1 is known as  
(a) Forward adaptive bit allocation      (b) Backward adaptive bit allocation  
(c) hybrid adaptive bit allocation      (d) none of the above
- The compression ratio achieved by JPEG2000 without loss of quality is  
(a) 2000:1                      (b) 200:1                      (c) 20:1                      (d) 2:1

6. The compression ratio achieved by MPEG-1 standard is  
 (a) 4000:1                      (b) 400:1                      (c) 40:1                      (d) 4:1
7. The minimum distance of linear block code ( $d_{\min}$ ) is equal to minimum number of rows or columns of  $H^T$ , whose \_\_\_\_\_ is equal to zero vector?  
 (a) sum                      (b) difference                      (c) product                      (d) division
8. If the parity check matrix is H and the error vector is E then syndrome vector S can be calculated by  
 (a)  $S=HE^H$                       (b)  $EH^T$                       (c)  $E^T H^T$                       (d)  $(EH)^T$
9. While representing the convolutional code by (n, k, m), what does 'm' signify or represent in it?  
 (a) memory order      (b) message bits                      (c) coded bits                      (d) all the above
10. In Viterbi's algorithm, the selected paths are regarded as  
 (a) survivors                      (b) defenders                      (c) destroyers                      (d) carriers

PART - B (5 x 2 = 10 Marks)

11. What is a Binary Symmetric channel?
12. Define linear predictive coding.
13. State motion compensation.
14. What are linear codes? Give example.
15. What are convolutional codes?

PART - C (5 x 16 = 80 Marks)

16. (a) Generate Shannon-Fano binary, Quaternary codes with probabilities 0.5, 0.25, 0.125, 0.0625, 0.03125, 0.015625, 0.0078125 and 0.0078125. Calculate its efficiency in each case. (16)

Or

- (b) Consider a source with source symbol set  $S = \{S_1, S_2, S_3, S_4\}$  with probabilities  $P = \{0.2, 0.3, 0.4, 0.1\}$ . Obtain the entropy of the source. Prove that  $H(S^2) = 2XH(S)$ . (16)

17. (a) Apply Arithmetic coding for the word 'WENT.' (16)

Symbol	W	E	N	T	.
Probability	0.1	0.3	0.3	0.2	0.1

Or

- (b) Discuss on linear predictive coding with an example. (16)
18. (a) Discuss in detail about the Image and Video formats. (16)

Or

- (b) What is TIFF? Draw and explain the TIFF audio encoder and decoder. (16)
19. (a) The generator polynomial of a (7,4) cyclic code is  $G(P) = P^3 + P + 1$ . Find all the code vectors for the code in the systematic and non-systematic form. (16)

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 determine the transmitted data word for the received code word 1101100. (16)
20. (a) Discuss on convolutional turbo codes. (16)

Or

- (b) Draw the diagram of the  $\frac{1}{2}$  rate convolutional encoder with generator polynomials  $g^{(1)}(D) = 1 + D$  and  $g^{(2)}(D) = 1 + D + D^2$ . Also compute the encoder output for input sequence 101101. Obtain the code tree, code trellis and state diagram. (16)
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