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CODE NO:- U-37

FACULTY OF ENGINEERING& TECHNOLOGY

Third Engg Examination

DECEMBER2014

Signal Coding & Estimation Theory

TE-(EC/ETC/E&C)(Revised)

[Time: THREE *Hours*] **[Max. Marks: 80]**

"Please check whether you have got the right question paper."

N.B
1) Question number 1 & 6 are compulsory.
2) Solve any two question from Q.2, Q.3, Q.4 & Q.5 section A.
3) Solve any two question from Q.7, Q.8, Q.9 & Q.10 section B.

SECTION A

Q.1 Solve any 2 10
- i) Explain properties of mutual information.
- ii) Explain cascaded channel.
- iii) Explain arithmetic coding.

Q.2 A) Show that entropy of nth extension of DMS is n-times the entropy of original source. 07

B) A black and white TV picture consists of 525 lines of picture information. Assume that each line consists of 525 picture elements & that each element can have 256 brightness pixels levels. Pictures are prepared at the rate of 30 frames/sec. calculate the average rate of information conveyed by a TV set to a viewer. 08

Q.3 A) State and explain channel capacity theorem. 07

B) Prove that mutual information of a channels is symmetric [{A,B)=I(B,A)] 08

Q.4 A) Explain binary erasure channel & find out its channel capacity. 08

B) Explain source coding theorem. 07

Q.5 Apply both ShannonFano and Hoffman coding algorithm $p(x_1)=0.3$, $p(x_2)=0.25$, $p(x_3)=0.2$ $p(x_4)=0.12$,$p(x_5)=0.08$,$p(x_6)=0.05$ find 15
- i) Entropy
- ii) Average length
- iii) Efficiency & Redundancy.

SECTION B

Q.6 Solve any 2 (short note) 10
- i) Hamming weigh & hamming distance.
- ii) Properties of cyclic codes.
- iii) Maximum likely hood estimation.

Q.7 A) Explain perfect codes in detail. 05

B) An error control code has parity check matrix. 10

$$H=\left(\begin{array}{cccc|cc} 1 & 0 & 1 & 1 & 0 & 0 \\ 1 & 1 & 0 & 0 & 1 & 0 \\ 0 & 1 & 1 & 0 & 0 & 1 \end{array}\right)$$

i) Determine G-matrix.
ii) Find code word that begins with 101…….
iii) Decode the received code word 110110. Comment on error detection & correction capability of this code.
iv) What is the relation between G&H.

Q.8 A) Explain the operation of encoder of cyclic code with diagram. 07

B) For (7,4) cyclic code, the received vector 2(x) is 1110101 & the generator polynomial is $G(x)=1+x+x^3$. Draw syndrome calculation CKT& correct the single error in received vector. 08

Q.9 A) Explain transform domain approach. 07

B) Explain viterbi decoding algorithm. 08

Q.10 A) Explain 08

i) BCH code.
ii) RS code.

B) What is estimation theory? Explain any one estimation method. 07