## [4858]-1046

## T.E. (E & TC) (End - Semester) (Semester - II)
## INFORMATION THEORY & LODING TECHNIQUES
### (2012 Pattern)

*Time : 2.½ Hours]*

*[Max. Marks : 70*

***Instructions to the candidates:***
1) *Answer Q1 or 2, Q3 or 4, Q5 or 6, Q7 or 8.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Assume suitable data, if necessary.*
4) *Use of logarithmic tables slide rule, mollier charts, electronic pocket calculator and steam tables is allowed.*

**Q1)** a) Design a Huffman code for a source generating 4 different types of messages with probabilities 0.3, 0.2, 0.4, 0.1. Find the coding efficiency. **[7]**

b) What are Golay codes? Explain with suitable example. **[7]**

c) Write the procedure for coding of cyclic codes. **[6]**

### OR

**Q2)** a) A 3 bit PCM system generates 1000 samples/sec. If the quantized samples are produced by the system with probabilities $\left\{\frac{1}{4}, \frac{1}{4}, \frac{1}{8}, \frac{1}{8}, \frac{1}{16}, \frac{1}{16}, \frac{1}{16}, \frac{1}{16}\right\}$ Then find the rate of information. If the samples are equiprobable, what will be rate of information? **[7]**

b) What are Hamming codes? Explain with suitable example. **[7]**

c) For a (7,4) cyclic code, with generator polynonial $g(x) = x^3 + x^2 + 1$, what will be codewords for following message words. **[6]**
i) 1011          ii) 1110

**Q3)** a) Find the generator polynonial for BCH code with codeword length n = 15 and error correcting capability $t_c$ = 2. **[10]**

b) Explain Go-Back-N ARQ. **[6]**

*P.T.O.*

**OR**

**Q4)** a) For a (7,5) RS code, the received codeword polynomid is given as:

$r(x) = x^5 + \alpha^5 x^4 + \alpha^2 x^3 + x^2 + \alpha^6 x + \alpha^3$ where $\alpha$ is element of aF($2^3$).
Find the corrected codeword polynomial, if there is single error in the received codeword. **[8]**

b) Write features of BCH codes. **[4]**

c) What is FEC & ARQ systems? **[4]**

**Q5)** a) Draw the trellis diagram for following encoder **[8]**
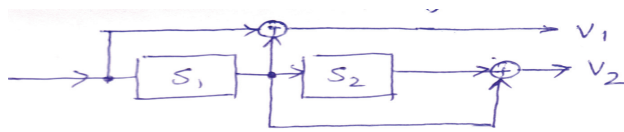


b) Explain with example polynomial description of convolutional codes.**[8]**

c) Draw the block diagram for coding process Turbo codes. **[2]**

**OR**

**Q6)** a) Explain viterbi's algorithm for decoding of convolutional codes. **[8]**

b) Explain generating function for convolutional codes. **[8]**

c) Write any two features of LDPC codes. **[2]**

**Q7)** a) What are the goals of communication system designer? Explain any three of them. **[6]**

b) What is Nyquist minimum bandwidth? **[4]**

c) Explain in brief trade off between modulation and coding. **[4]**

**OR**

**Q8)** a) Explain how coding gain is improved in TCM. **[8]**

b) Write shannon-Hartley capacity theorem. What are its implications? **[8]**

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