PC-1689/M

L-4/2050

ALGEBRAIC CODING THEORY-MM-709/AMC-418

(Semester–IV)

(Common for Math/AMC)

Time : Two Hours] [Maximum Marks : 70

Note : Attempt any *four* questions. All questions carry equal marks.

I. (a) Write down the types of error correcting codes.

(b) Explain parity bit and brute force repetition and Hamming distance.

II. (a) Discuss maximum likelihood decoding.

(b) Explain finite fields.

III. Let a binary code of length 16 wirtten as 4×4 square matrices. The code E is composed of every 4×4 binary matrix M such that :

(a) Every row of M contains an even number of 1's and

(b) Either every column of M contains an even number of 1's and every column of M contains an odd number of 1's.

IV. If K = $\{G_1, aG_2, \ldots\ldots a^{t-1} G_t\}$ + I and K = $\{G_1, aG_2, \ldots\ldots a^{t-1} G_t\}$ + I is a semisimple abelian code with the conditions then prove that its dual code is :

K′ = $\{\tau(G_0), a\tau(G_T), \ldots\ldots\ldots a^{t-1}\tau(G_2)\}$ + I, where the polynomials $\tau(G_i)$, i = 0, 2, 3, ... t also satisfy the same conditions.

V. (a) Describe the operations regarding how to produce a new codes by modifying in some way the codewords of a given code.

(b) Explain sphere covering bound.

VI. (a) A byte of data : 10011010 is given. Create the data word, learning spaces for the parity bits ___ ___ 1 ___ 001 ___ 1010.

(b) Explain perfect codes.

VII. Pick your favorite polynomial $m(x) \in f_2[x]$ of degree at most 4 and encode it, by computing $c(x) = m(x)\ g(x)$ mod $(x^{15} + 1)$ now choose a random binary error vector e of weight at most 3 and compute the word r that is received at the other end of channel $r = c + e$.

VIII. (a) Discuss Plotkin bound.

(b) Explain linear programming bound.

IX. (a) Define error correcting codes.

(b) Explain minimal polynomial of a matrix.

(c) Show that a linear code has distance d, if and only if any $(d - 1)$ columns of the parity check matrix is linearly independent and $\exists$ d column that are linearly dependent.

(d) What do you mean by syndrome in information theory and coding ?

(e) Find and check digits for ISBN 3-12-565751.

(f) How do you write a Hamming code ?

(g) Discuss generator matrix with an example.

(h) How do you find the minimum distance of a linear code ?

(i) Write down irreducible qudratics over GF(3).

(j) Discuss about MDS codes.
