Q. P. Code: 4MMPG5

BHARATA MATA COLLEGE, THRIKKAKARA
FIRST INTERNAL EXAMINATION JAN. 2020
M.Sc. MATHEMATICS, SEM.- IV
CODING THEORY

TIME: $1^1/_2$ Hrs. **Max. Weight:15**

Section A
Answer any 4 Questions
Each question carries 1 weight

1. Define weight of a vector. Show that $d(u, v) = wt.(u - v)$ is a metric.
2. Define a self orthogonal code. Give an example of a binary self orthogonal code.
3. Describe Maximum-likelihood decoding.
4. Define a perfect code. Give an example.
5. Give the parity check matrix for Ham[7, 4] code.

Section B
Answer any 3 Questions
Each question carries 2 weight

6. If *u* = (0,1,0,1,1), *v* = (1,1,0,1,0) and *w* = (0,1,1,0,0) then, compare
   (a) $d(v, w)$ and $d(v, u) + d(u, w)$ and (b) $wt.(v + w)$ and $wt.(v) + wt.(w)$.
7. Define Hamming decoding and decode the message (0,1,1,1,0,0,1).
8. Find the weight distribution of Extended Ham[8, 4] code.
9. Prove that if *d* is the min. wt. of a code C, then C can correct $t = \left[\frac{d-1}{2}\right]$ or fewer errors and conversely.

Section C
Answer any 1 Question
Each question carries 5 weight

10. (a) If the rows of a G. M. G for a [n, k] code C have weights divisible by 4 and are orthogonal to each other , then prove that C is self orthogonal and all weights in C are divisible by 4.
    (b) Find PCM for the Code C = {0000, 1001, 0110, 1111}.
11. (a) Prove that every vector in a fixed coset has same syndrome and vectors in different cosets have different syndromes. Also show that all possible q^{n-k}syndromes occur.
    (b) Define complete and incomplete deciding.
