

SC 461

Introduction to Coding Theory and its Applications

Dhirubhai Ambani Institute of Information and Communication Technology (DA-IICT)

Version 1 (Spring 2011)

INSTRUCTIONS:

- There are total 5 printed pages. Ensure that you have all the pages.
- Answer **all questions**, writing clearly in the space provided.
- Show all your work and explain how you arrived at your answers, unless explicitly told to do otherwise.
- Write your name and student number **clearly** at the top of each page.
- You have **one hour** to complete the test
- Marks for each question are indicated in brackets at right. You may use point form for your answers, but make sure the points are clear and unambiguous.

FOR MARKER'S USE ONLY

Question	Possible	Received
1	10	
2	10	
3	10	
4	15	
TOTAL	45	

1. (a) Give an example of a field with 4 number of elements (also justify your answer). (4)

(b) Indicate weather the following statements are **True** / **False** (also justify your answer).

i) The code $\mathcal{C} = \{0000, 1002, 0101, 1100\}$ is a non-linear binary code with $n = 4$ and $d = 2$.

ii) \mathbb{Z}_6 is a field with 6 number of elements.

iii) An odd repetition code \mathcal{C} with parameters $[2m + 1, 1, 2m + 1]$ is a perfect code. (6)

2. (a) Let H be the parity check matrix of a linear code $[n, k, d]$. Show that the code has minimum distance d if and only if every $d - 1$ columns of H are linearly independent and some d columns are linearly dependent. (10)

Sample Question Paper: Feb, 2011, Version 1.0

3. (a) Show that a linear code \mathcal{C} with parameters $[n, k, d]$ can correct $\lfloor \frac{d-1}{2} \rfloor$ errors. (10)

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4. (a) Does there exist a $[9, 2, 5]$ binary linear code? (5)

(b) Let G be the generator matrix of a binary linear code with parameters $[4, 2, 2]$ shown below. Use this code to decode a received word $y = 0001$. What will happen if you try to decode $y = 0100$? Explain.

$$G = \begin{bmatrix} 1011 \\ 0101 \end{bmatrix}.$$

(10)