# NATIONAL INSTITUTE OF TECHNOLOGY, KURUKSHETRA

## B.TECH., 4th SEMESTER, MID-EXAM-2 (AY 2023-24)

## SUBJECT: INFORMATION THEORY AND CODING

## COURSE CODE: ECPC-212

Maximum Marks: **20** Time: **50 MTS**

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|---|---|---|
| 1. | Consider a **Systematic (8,4) Linear Block Code** whose parity check equations are<br>$v_0 = u_1 + u_2 + u_3$<br>$v_1 = u_0 + u_1 + u_2$<br>$v_2 = u_0 + u_1 + u_3$<br>$v_3 = u_0 + u_2 + u_3$<br>Where $u_0, u_1, u_2, u_3$ are message digits, and $v_0, v_1, v_2, v_3$ are parity check digits.<br>(i) Find the generator matrix of the code.<br>(ii) Find the parity check matrix of the code.<br>(iii) Construct the Encoder circuit for the given problem. | **6M** |
| 2. | Given the (7,4) Linear code with **generator matrix G** $G = \left[\begin{array}{cccc\|ccc} 1 & 1 & 1 & 1 & 1 & 1 & 1 \\ 0 & 1 & 1 & 1 & 0 & 1 & 0 \\ 0 & 0 & 1 & 1 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 & 0 & 1 & 1 \end{array}\right]$<br>(i) Determine the systematic form of generator matrix ***G***.<br>(ii) Find the parity check matrix ***H*** for the code.<br>(iii) Determine whether the received vector r = **[1101101]** contains an error or not. | **6M** |
| 3. | Construct a standard array for **(n,k) Linear Block Code** with the help of an example. And also explain the syndrome decoding operation using a standard array. | **4M** |
| 4. | Determine the **(7,4) non-systematic and systematic cyclic codeword polynomials** for message bits $m_0$ = **1100**, $m_1$ = **1101**, with generator polynomial $g(X) = X^3 + X + 1$. | **4M** |

**ALL THE BEST**