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Class: DMA-B05

***HOMEWORK***

***DISCRETE MATHEMATICS***

***PROBLEM SET 07***

***Problem 1:***

Packets 2,1,3. (2 lost)

Consider P(2) = 2, P(3) = 1, P(5) = 3

P(x) go through (2,2) , (3,1) , (5,3)

=> P(x) =

=> P(x) =

Send P(1) = , P(2) = 2, P(3) = 1, P(4) = , P(5) = 3

Receive P(2) = 2, P(3) = 1, P(5) = 3

=> The corrected values of the error packages are P(1) = and P(4) =

***Problem 2:***

1. Error rate is 1/5 => k = 1 => E(x) degree 1 => E(x) = x + b0

n + 2k = 5 => n = 3 => P(x) degree (n-1) = 2

Q(x) = P(x) \* E(x) => Q(x) degree 3 => Q(x) = a3x3 + a2x2 + a1x + a0

R(x1) = R(1) = 2 R(x4) = R(4) = 5

R(x2) = R(2) = 1 R(x5) = R(5) = 3

R(x3) = R(3) = 4

Have: Q(x) = R(x)\*E(x)

=> Q(1) = R(1)\*E(1)

….………………….

Q(5) = R(5)\*E(5)

=> a3 + a2 + a1 + a0 = 2 + 2b0 ≡ a3 + a2 + a1 + a0 +5b0 = 2

a3 + 4a2 + 2a1+ a0 = 2 + b0 ≡ a3 + 4a2 + 2a1+ a0 + 6b0 = 2

6a3 + 2a2 + 3a1 + a0 = 5 + 4b0 ≡ 6a3 + 2a2 + 3a1 + a0 + 3b0 = 5

a3 + 2a2 + 4a1 + a0 = 6 + 5b0 ≡ a3 + 2a2 + 4a1 + a0 + 2b0 = 6

6a3 + 4a2 + 5a1 + a0 = 1 + 3b0 ≡ 6a3 + 4a2 + 5a1 + a0 + 4b0 = 1

=> a3 = ≡ 1 (mod 7)

a2 = ≡ 0 (mod 7)

a1 = ≡ 3 (mod 7)

a0 = ≡ 6 (mod 7)

b0 = ≡ 4 (mod 7)

=> Q(x) = and E(x) = => E(3) = 0 => packet x3 at which error occurred

=> P(x) = R(x) = Q(x) / E(x) = ≡ (mod 7)

=>The corrected value of the error packet is: P(3) = 23 (mod 7)

1. Error rate is 1/5 => k = 1 => E(x) degree 1 => E(x) = x + b0

n + 2k = 5 => n = 3 => P(x) degree (n-1) = 2

Q(x) = P(x) \* E(x) => Q(x) degree 3 => Q(x) = a3x3 + a2x2 + a1x + a0

R(x1) = R(1) = 3 R(x4) = R(4) = 2

R(x2) = R(2) = 2 R(x5) = R(5) = 5

R(x3) = R(3) = 1

Have: Q(x) = R(x)\*E(x)

=> Q(1) = R(1)\*E(1)

….………………….

Q(5) = R(5)\*E(5)

=> a3 + a2 + a1 + a0 = 3(1 + b0)≡ a3 + a2 + a1 + a0 +4b0 = 3

a3 + 4a2 + 2a1+ a0 = 2(2 + b0)≡ a3 + 4a2 + 2a1+ a0 + 5b0 = 4

6a3 + 2a2 + 3a1 + a0 = 1(3 + b0)≡ 6a3 + 2a2 + 3a1 + a0 + 6b0 = 3

a3 + 2a2 + 4a1 + a0 = 2(4 + b0)≡ a3 + 2a2 + 4a1 + a0 + 5b0 = 1

6a3 + 4a2 + 5a1 + a0 = 5(5 + b0)≡ 6a3 + 4a2 + 5a1 + a0 + 2b0 = 4

=> a3 = ≡ 1 (mod 7)

a2 = ≡ 0 (mod 7)

a1 = ≡ 2 (mod 7)

a0 = 4 (mod 7)

b0 = ≡ -1 ≡ 6 (mod 7)

=> Q(x) = and E(x) = => E(1) = 0 => packet x1 at which error occurred

=> P(x) = R(x) = Q(x) / E(x) =

=>The corrected value of the error packet is: P(1) = 5

1. Error rate is 1/5 => k = 1 => E(x) degree 1 => E(x) = x + b0

n + 2k = 5 => n = 3 => P(x) degree (n-1) = 2

Q(x) = P(x) \* E(x) => Q(x) degree 3 => Q(x) = a3x3 + a2x2 + a1x + a0

R(x1) = R(1) = 5 R(x4) = R(4) = 2

R(x2) = R(2) = 1 R(x5) = R(5) = 5

R(x3) = R(3) = 1

Have: Q(x) = R(x)\*E(x)

=> Q(1) = R(1)\*E(1)

….………………….

Q(5) = R(5)\*E(5)

=> a3 + a2 + a1 + a0 = 5(1 + b0)≡ a3 + a2 + a1 + a0 +2b0 = 5

a3 + 4a2 + 2a1+ a0 = 1(2 + b0)≡ a3 + 4a2 + 2a1+ a0 + 6b0 = 2

6a3 + 2a2 + 3a1 + a0 = 1(3 + b0)≡ 6a3 + 2a2 + 3a1 + a0 + 6b0 = 3

a3 + 2a2 + 4a1 + a0 = 2(4 + b0)≡ a3 + 2a2 + 4a1 + a0 + 5b0 = 1

6a3 + 4a2 + 5a1 + a0 = 5(5 + b0)≡ 6a3 + 4a2 + 5a1 + a0 + 2b0 = 4

=> a3 = ≡ 1 (mod 7)

a2 = ≡ 6 (mod 7)

a1 = ≡ 1 (mod 7)

a0 = ≡ 1 (mod 7)

b0 = ≡ -2 ≡ 5 (mod 7)

=> Q(x) = and E(x) = => E(2) = 0 => packet x2 at which error occurred

=> P(x) = R(x) = Q(x) / E(x) =

=> The corrected value of the error packet is: P(2) = 9 2 (mod 7)

1. Error rate is 1/5 => k = 1 => E(x) degree 1 => E(x) = x + b0

n + 2k = 5 => n = 3 => P(x) degree (n-1) = 2

Q(x) = P(x) \* E(x) => Q(x) degree 3 => Q(x) = a3x3 + a2x2 + a1x + a0

R(x1) = R(1) = 5 R(x4) = R(4) = 2

R(x2) = R(2) = 2 R(x5) = R(5) = 5

R(x3) = R(3) = 3

Have: Q(x) = R(x)\*E(x)

=> Q(1) = R(1)\*E(1)

….………………….

Q(5) = R(5)\*E(5)

=> a3 + a2 + a1 + a0 = 5(1 + b0)≡ a3 + a2 + a1 + a0 +2b0 = 5

a3 + 4a2 + 2a1+ a0 = 2(2 + b0)≡ a3 + 4a2 + 2a1+ a0 + 5b0 = 4

6a3 + 2a2 + 3a1 + a0 = 3(3 + b0)≡ 6a3 + 2a2 + 3a1 + a0 + 4b0 = 2

a3 + 2a2 + 4a1 + a0 = 2(4 + b0)≡ a3 + 2a2 + 4a1 + a0 + 5b0 = 1

6a3 + 4a2 + 5a1 + a0 = 5(5 + b0)≡ 6a3 + 4a2 + 5a1 + a0 + 2b0 = 4

=> a3 = ≡ 1 (mod 7)

a2 = ≡ 5 (mod 7)

a1 = ≡ 0 (mod 7)

a0 = ≡ 5 (mod 7)

b0 = ≡ -3 ≡ 4 (mod 7)

=> Q(x) = and E(x) = => E(3) = 0 => packet x3 at which error occurred

=> P(x) = R(x) = Q(x) / E(x) = ≡

=> The corrected value of the error packet is: P(3) = 15 1 (mod 7)