## 5.1 CRC calculation

Denote the input bits to the CRC computation by , and the parity bits by , where  is the size of the input sequence and  is the number of parity bits. The parity bits are generated by one of the following cyclic generator polynomials:

-  for a CRC length ;

-  for a CRC length ;

-  for a CRC length ;

-  for a CRC length ;

-  for a CRC length ;

-  for a CRC length .

The encoding is performed in a systematic form, which means that in GF(2), the polynomial:



yields a remainder equal to 0 when divided by the corresponding CRC generator polynomial.

The bits after CRC attachment are denoted by , where . The relation between  and  is:

 for 

 for .

## 5.2 Code block segmentation and code block CRC attachment

### 5.2.2 Low density parity check coding

The input bit sequence to the code block segmentation is denoted by , where . If  is larger than the maximum code block size , segmentation of the input bit sequence is performed and an additional CRC sequence of  bits is attached to each code block.

For LDPC base graph 1, the maximum code block size is:

- .

For LDPC base graph 2, the maximum code block size is:

- .

Total number of code blocks *C* is determined by:

if 



Number of code blocks: 



else



Number of code blocks: .



end if

The bits output from code block segmentation are denoted by , where  is the code block number, and  is the number of bits for the code block number .

The number of bits  in each code block is calculated as:

;

For LDPC base graph 1,

.

For LDPC base graph 2,

if 

;

elseif 

;

elseif 

;

else

;

end if

find the minimum value of  in all sets of lifting sizes in Table 5.3.2-1, denoted as , such that , and set  for LDPC base graph 1 and  for LDPC base graph 2;

The bit sequence  is calculated as:

;

for  to 

for  to 

;

;

end for

if 

The sequence  is used to calculate the CRC parity bits  according to Clause 5.1 with the generator polynomial .

for  to 

;

end for

end if

for  to  -- Insertion of filler bits

;

end for

end for

## 5.3 Channel coding

### 5.3.2 Low density parity check coding

The bit sequence input for a given code block to channel coding is denoted by , where  is the number of bits to encode as defined in Clause 5.2.2. After encoding the bits are denoted by , where  for LDPC base graph 1 and  for LDPC base graph 2, and the value of  is given in Clause 5.2.2.

For a code block encoded by LDPC, the following encoding procedure applies:

1) Find the set with index  in Table 5.3.2-1 which contains .

2) for  to 

if 

;

else

;

;

end if

end for

3) Generate  parity bits  such that , where ;  is a column vector of all elements equal to 0. The encoding is performed in GF(2).

For LDPC base graph 1, a matrix of  has 46 rows with row indices and 68 columns with column indices . For LDPC base graph 2, a matrix of  has 42 rows with row indices and 52 columns with column indices . The elements in  with row and column indices given in Table 5.3.2-2 (for LDPC base graph 1) and Table 5.3.2-3 (for LDPC base graph 2) are of value 1, and all other elements in  are of value 0.

The matrix  is obtained by replacing each element of  with a  matrix, according to the following:

- Each element of value 0 in  is replaced by an all zero matrix of size ;

- Each element of value 1 in  is replaced by a circular permutation matrix  of size , where  and  are the row and column indices of the element, and  is obtained by circularly shifting the identity matrix of size  to the right  times. The value of  is given by . The value of  is given by Tables 5.3.2-2 and 5.3.2-3 according to the set index  and LDPC base graph.

4) for  to 

;

end for

Table 5.3.2-1: Sets of LDPC lifting size 

|  |  |
| --- | --- |
| *Set index (**)* | *Set of lifting sizes (**)* |
| 0 | {2, 4, 8, 16, 32, 64, 128, 256} |
| 1 | {3, 6, 12, 24, 48, 96, 192, 384} |
| 2 | {5, 10, 20, 40, 80, 160, 320} |
| 3 | {7, 14, 28, 56, 112, 224} |
| 4 | {9, 18, 36, 72, 144, 288} |
| 5 | {11, 22, 44, 88, 176, 352} |
| 6 | {13, 26, 52, 104, 208} |
| 7 | {15, 30, 60, 120, 240} |

Table 5.3.2-2: LDPC base graph 1 () and its parity check matrices ()

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | |  | | | | | | | |  | |  | | | | | | | |
| Row  index | Column  index | Set index | | | | | | | | Row  index | Column  index | Set index | | | | | | | |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 0 | 0 | 250 | 307 | 73 | 223 | 211 | 294 | 0 | 135 | 15 | 1 | 96 | 2 | 290 | 120 | 0 | 348 | 6 | 138 |
| 1 | 69 | 19 | 15 | 16 | 198 | 118 | 0 | 227 | 10 | 65 | 210 | 60 | 131 | 183 | 15 | 81 | 220 |
| 2 | 226 | 50 | 103 | 94 | 188 | 167 | 0 | 126 | 13 | 63 | 318 | 130 | 209 | 108 | 81 | 182 | 173 |
| 3 | 159 | 369 | 49 | 91 | 186 | 330 | 0 | 134 | 18 | 75 | 55 | 184 | 209 | 68 | 176 | 53 | 142 |
| 5 | 100 | 181 | 240 | 74 | 219 | 207 | 0 | 84 | 25 | 179 | 269 | 51 | 81 | 64 | 113 | 46 | 49 |
| 6 | 10 | 216 | 39 | 10 | 4 | 165 | 0 | 83 | 37 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 9 | 59 | 317 | 15 | 0 | 29 | 243 | 0 | 53 | 16 | 1 | 64 | 13 | 69 | 154 | 270 | 190 | 88 | 78 |
| 10 | 229 | 288 | 162 | 205 | 144 | 250 | 0 | 225 | 3 | 49 | 338 | 140 | 164 | 13 | 293 | 198 | 152 |
| 11 | 110 | 109 | 215 | 216 | 116 | 1 | 0 | 205 | 11 | 49 | 57 | 45 | 43 | 99 | 332 | 160 | 84 |
| 12 | 191 | 17 | 164 | 21 | 216 | 339 | 0 | 128 | 20 | 51 | 289 | 115 | 189 | 54 | 331 | 122 | 5 |
| 13 | 9 | 357 | 133 | 215 | 115 | 201 | 0 | 75 | 22 | 154 | 57 | 300 | 101 | 0 | 114 | 182 | 205 |
| 15 | 195 | 215 | 298 | 14 | 233 | 53 | 0 | 135 | 38 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 16 | 23 | 106 | 110 | 70 | 144 | 347 | 0 | 217 | 17 | 0 | 7 | 260 | 257 | 56 | 153 | 110 | 91 | 183 |
| 18 | 190 | 242 | 113 | 141 | 95 | 304 | 0 | 220 | 14 | 164 | 303 | 147 | 110 | 137 | 228 | 184 | 112 |
| 19 | 35 | 180 | 16 | 198 | 216 | 167 | 0 | 90 | 16 | 59 | 81 | 128 | 200 | 0 | 247 | 30 | 106 |
| 20 | 239 | 330 | 189 | 104 | 73 | 47 | 0 | 105 | 17 | 1 | 358 | 51 | 63 | 0 | 116 | 3 | 219 |
| 21 | 31 | 346 | 32 | 81 | 261 | 188 | 0 | 137 | 21 | 144 | 375 | 228 | 4 | 162 | 190 | 155 | 129 |
| 22 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 39 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 23 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 18 | 1 | 42 | 130 | 260 | 199 | 161 | 47 | 1 | 183 |
| 1 | 0 | 2 | 76 | 303 | 141 | 179 | 77 | 22 | 96 | 12 | 233 | 163 | 294 | 110 | 151 | 286 | 41 | 215 |
| 2 | 239 | 76 | 294 | 45 | 162 | 225 | 11 | 236 | 13 | 8 | 280 | 291 | 200 | 0 | 246 | 167 | 180 |
| 3 | 117 | 73 | 27 | 151 | 223 | 96 | 124 | 136 | 18 | 155 | 132 | 141 | 143 | 241 | 181 | 68 | 143 |
| 4 | 124 | 288 | 261 | 46 | 256 | 338 | 0 | 221 | 19 | 147 | 4 | 295 | 186 | 144 | 73 | 148 | 14 |
| 5 | 71 | 144 | 161 | 119 | 160 | 268 | 10 | 128 | 40 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7 | 222 | 331 | 133 | 157 | 76 | 112 | 0 | 92 | 19 | 0 | 60 | 145 | 64 | 8 | 0 | 87 | 12 | 179 |
| 8 | 104 | 331 | 4 | 133 | 202 | 302 | 0 | 172 | 1 | 73 | 213 | 181 | 6 | 0 | 110 | 6 | 108 |
| 9 | 173 | 178 | 80 | 87 | 117 | 50 | 2 | 56 | 7 | 72 | 344 | 101 | 103 | 118 | 147 | 166 | 159 |
| 11 | 220 | 295 | 129 | 206 | 109 | 167 | 16 | 11 | 8 | 127 | 242 | 270 | 198 | 144 | 258 | 184 | 138 |
| 12 | 102 | 342 | 300 | 93 | 15 | 253 | 60 | 189 | 10 | 224 | 197 | 41 | 8 | 0 | 204 | 191 | 196 |
| 14 | 109 | 217 | 76 | 79 | 72 | 334 | 0 | 95 | 41 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 15 | 132 | 99 | 266 | 9 | 152 | 242 | 6 | 85 | 20 | 0 | 151 | 187 | 301 | 105 | 265 | 89 | 6 | 77 |
| 16 | 142 | 354 | 72 | 118 | 158 | 257 | 30 | 153 | 3 | 186 | 206 | 162 | 210 | 81 | 65 | 12 | 187 |
| 17 | 155 | 114 | 83 | 194 | 147 | 133 | 0 | 87 | 9 | 217 | 264 | 40 | 121 | 90 | 155 | 15 | 203 |
| 19 | 255 | 331 | 260 | 31 | 156 | 9 | 168 | 163 | 11 | 47 | 341 | 130 | 214 | 144 | 244 | 5 | 167 |
| 21 | 28 | 112 | 301 | 187 | 119 | 302 | 31 | 216 | 22 | 160 | 59 | 10 | 183 | 228 | 30 | 30 | 130 |
| 22 | 0 | 0 | 0 | 0 | 0 | 0 | 105 | 0 | 42 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 23 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 21 | 1 | 249 | 205 | 79 | 192 | 64 | 162 | 6 | 197 |
| 24 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 121 | 102 | 175 | 131 | 46 | 264 | 86 | 122 |
| 2 | 0 | 106 | 205 | 68 | 207 | 258 | 226 | 132 | 189 | 16 | 109 | 328 | 132 | 220 | 266 | 346 | 96 | 215 |
| 1 | 111 | 250 | 7 | 203 | 167 | 35 | 37 | 4 | 20 | 131 | 213 | 283 | 50 | 9 | 143 | 42 | 65 |
| 2 | 185 | 328 | 80 | 31 | 220 | 213 | 21 | 225 | 21 | 171 | 97 | 103 | 106 | 18 | 109 | 199 | 216 |
| 4 | 63 | 332 | 280 | 176 | 133 | 302 | 180 | 151 | 43 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 5 | 117 | 256 | 38 | 180 | 243 | 111 | 4 | 236 | 22 | 0 | 64 | 30 | 177 | 53 | 72 | 280 | 44 | 25 |
| 6 | 93 | 161 | 227 | 186 | 202 | 265 | 149 | 117 | 12 | 142 | 11 | 20 | 0 | 189 | 157 | 58 | 47 |
| 7 | 229 | 267 | 202 | 95 | 218 | 128 | 48 | 179 | 13 | 188 | 233 | 55 | 3 | 72 | 236 | 130 | 126 |
| 8 | 177 | 160 | 200 | 153 | 63 | 237 | 38 | 92 | 17 | 158 | 22 | 316 | 148 | 257 | 113 | 131 | 178 |
| 9 | 95 | 63 | 71 | 177 | 0 | 294 | 122 | 24 | 44 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10 | 39 | 129 | 106 | 70 | 3 | 127 | 195 | 68 | 23 | 1 | 156 | 24 | 249 | 88 | 180 | 18 | 45 | 185 |
| 13 | 142 | 200 | 295 | 77 | 74 | 110 | 155 | 6 | 2 | 147 | 89 | 50 | 203 | 0 | 6 | 18 | 127 |
| 14 | 225 | 88 | 283 | 214 | 229 | 286 | 28 | 101 | 10 | 170 | 61 | 133 | 168 | 0 | 181 | 132 | 117 |
| 15 | 225 | 53 | 301 | 77 | 0 | 125 | 85 | 33 | 18 | 152 | 27 | 105 | 122 | 165 | 304 | 100 | 199 |
| 17 | 245 | 131 | 184 | 198 | 216 | 131 | 47 | 96 | 45 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 18 | 205 | 240 | 246 | 117 | 269 | 163 | 179 | 125 | 24 | 0 | 112 | 298 | 289 | 49 | 236 | 38 | 9 | 32 |
| 19 | 251 | 205 | 230 | 223 | 200 | 210 | 42 | 67 | 3 | 86 | 158 | 280 | 157 | 199 | 170 | 125 | 178 |
| 20 | 117 | 13 | 276 | 90 | 234 | 7 | 66 | 230 | 4 | 236 | 235 | 110 | 64 | 0 | 249 | 191 | 2 |
| 24 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 11 | 116 | 339 | 187 | 193 | 266 | 288 | 28 | 156 |
| 25 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 22 | 222 | 234 | 281 | 124 | 0 | 194 | 6 | 58 |
| 3 | 0 | 121 | 276 | 220 | 201 | 187 | 97 | 4 | 128 | 46 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 89 | 87 | 208 | 18 | 145 | 94 | 6 | 23 | 25 | 1 | 23 | 72 | 172 | 1 | 205 | 279 | 4 | 27 |
| 3 | 84 | 0 | 30 | 165 | 166 | 49 | 33 | 162 | 6 | 136 | 17 | 295 | 166 | 0 | 255 | 74 | 141 |
| 4 | 20 | 275 | 197 | 5 | 108 | 279 | 113 | 220 | 7 | 116 | 383 | 96 | 65 | 0 | 111 | 16 | 11 |
| 6 | 150 | 199 | 61 | 45 | 82 | 139 | 49 | 43 | 14 | 182 | 312 | 46 | 81 | 183 | 54 | 28 | 181 |
| 7 | 131 | 153 | 175 | 142 | 132 | 166 | 21 | 186 | 47 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8 | 243 | 56 | 79 | 16 | 197 | 91 | 6 | 96 | 26 | 0 | 195 | 71 | 270 | 107 | 0 | 325 | 21 | 163 |
| 10 | 136 | 132 | 281 | 34 | 41 | 106 | 151 | 1 | 2 | 243 | 81 | 110 | 176 | 0 | 326 | 142 | 131 |
| 11 | 86 | 305 | 303 | 155 | 162 | 246 | 83 | 216 | 4 | 215 | 76 | 318 | 212 | 0 | 226 | 192 | 169 |
| 12 | 246 | 231 | 253 | 213 | 57 | 345 | 154 | 22 | 15 | 61 | 136 | 67 | 127 | 277 | 99 | 197 | 98 |
| 13 | 219 | 341 | 164 | 147 | 36 | 269 | 87 | 24 | 48 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 14 | 211 | 212 | 53 | 69 | 115 | 185 | 5 | 167 | 27 | 1 | 25 | 194 | 210 | 208 | 45 | 91 | 98 | 165 |
| 16 | 240 | 304 | 44 | 96 | 242 | 249 | 92 | 200 | 6 | 104 | 194 | 29 | 141 | 36 | 326 | 140 | 232 |
| 17 | 76 | 300 | 28 | 74 | 165 | 215 | 173 | 32 | 8 | 194 | 101 | 304 | 174 | 72 | 268 | 22 | 9 |
| 18 | 244 | 271 | 77 | 99 | 0 | 143 | 120 | 235 | 49 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 20 | 144 | 39 | 319 | 30 | 113 | 121 | 2 | 172 | 28 | 0 | 128 | 222 | 11 | 146 | 275 | 102 | 4 | 32 |
| 21 | 12 | 357 | 68 | 158 | 108 | 121 | 142 | 219 | 4 | 165 | 19 | 293 | 153 | 0 | 1 | 1 | 43 |
| 22 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 19 | 181 | 244 | 50 | 217 | 155 | 40 | 40 | 200 |
| 25 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 21 | 63 | 274 | 234 | 114 | 62 | 167 | 93 | 205 |
| 4 | 0 | 157 | 332 | 233 | 170 | 246 | 42 | 24 | 64 | 50 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 102 | 181 | 205 | 10 | 235 | 256 | 204 | 211 | 29 | 1 | 86 | 252 | 27 | 150 | 0 | 273 | 92 | 232 |
| 26 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 236 | 5 | 308 | 11 | 180 | 104 | 136 | 32 |
| 5 | 0 | 205 | 195 | 83 | 164 | 261 | 219 | 185 | 2 | 18 | 84 | 147 | 117 | 53 | 0 | 243 | 106 | 118 |
| 1 | 236 | 14 | 292 | 59 | 181 | 130 | 100 | 171 | 25 | 6 | 78 | 29 | 68 | 42 | 107 | 6 | 103 |
| 3 | 194 | 115 | 50 | 86 | 72 | 251 | 24 | 47 | 51 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 12 | 231 | 166 | 318 | 80 | 283 | 322 | 65 | 143 | 30 | 0 | 216 | 159 | 91 | 34 | 0 | 171 | 2 | 170 |
| 16 | 28 | 241 | 201 | 182 | 254 | 295 | 207 | 210 | 10 | 73 | 229 | 23 | 130 | 90 | 16 | 88 | 199 |
| 21 | 123 | 51 | 267 | 130 | 79 | 258 | 161 | 180 | 13 | 120 | 260 | 105 | 210 | 252 | 95 | 112 | 26 |
| 22 | 115 | 157 | 279 | 153 | 144 | 283 | 72 | 180 | 24 | 9 | 90 | 135 | 123 | 173 | 212 | 20 | 105 |
| 27 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 52 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 6 | 0 | 183 | 278 | 289 | 158 | 80 | 294 | 6 | 199 | 31 | 1 | 95 | 100 | 222 | 175 | 144 | 101 | 4 | 73 |
| 6 | 22 | 257 | 21 | 119 | 144 | 73 | 27 | 22 | 7 | 177 | 215 | 308 | 49 | 144 | 297 | 49 | 149 |
| 10 | 28 | 1 | 293 | 113 | 169 | 330 | 163 | 23 | 22 | 172 | 258 | 66 | 177 | 166 | 279 | 125 | 175 |
| 11 | 67 | 351 | 13 | 21 | 90 | 99 | 50 | 100 | 25 | 61 | 256 | 162 | 128 | 19 | 222 | 194 | 108 |
| 13 | 244 | 92 | 232 | 63 | 59 | 172 | 48 | 92 | 53 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 17 | 11 | 253 | 302 | 51 | 177 | 150 | 24 | 207 | 32 | 0 | 221 | 102 | 210 | 192 | 0 | 351 | 6 | 103 |
| 18 | 157 | 18 | 138 | 136 | 151 | 284 | 38 | 52 | 12 | 112 | 201 | 22 | 209 | 211 | 265 | 126 | 110 |
| 20 | 211 | 225 | 235 | 116 | 108 | 305 | 91 | 13 | 14 | 199 | 175 | 271 | 58 | 36 | 338 | 63 | 151 |
| 28 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 24 | 121 | 287 | 217 | 30 | 162 | 83 | 20 | 211 |
| 7 | 0 | 220 | 9 | 12 | 17 | 169 | 3 | 145 | 77 | 54 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 44 | 62 | 88 | 76 | 189 | 103 | 88 | 146 | 33 | 1 | 2 | 323 | 170 | 114 | 0 | 56 | 10 | 199 |
| 4 | 159 | 316 | 207 | 104 | 154 | 224 | 112 | 209 | 2 | 187 | 8 | 20 | 49 | 0 | 304 | 30 | 132 |
| 7 | 31 | 333 | 50 | 100 | 184 | 297 | 153 | 32 | 11 | 41 | 361 | 140 | 161 | 76 | 141 | 6 | 172 |
| 8 | 167 | 290 | 25 | 150 | 104 | 215 | 159 | 166 | 21 | 211 | 105 | 33 | 137 | 18 | 101 | 92 | 65 |
| 14 | 104 | 114 | 76 | 158 | 164 | 39 | 76 | 18 | 55 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 29 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 34 | 0 | 127 | 230 | 187 | 82 | 197 | 60 | 4 | 161 |
| 8 | 0 | 112 | 307 | 295 | 33 | 54 | 348 | 172 | 181 | 7 | 167 | 148 | 296 | 186 | 0 | 320 | 153 | 237 |
| 1 | 4 | 179 | 133 | 95 | 0 | 75 | 2 | 105 | 15 | 164 | 202 | 5 | 68 | 108 | 112 | 197 | 142 |
| 3 | 7 | 165 | 130 | 4 | 252 | 22 | 131 | 141 | 17 | 159 | 312 | 44 | 150 | 0 | 54 | 155 | 180 |
| 12 | 211 | 18 | 231 | 217 | 41 | 312 | 141 | 223 | 56 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 16 | 102 | 39 | 296 | 204 | 98 | 224 | 96 | 177 | 35 | 1 | 161 | 320 | 207 | 192 | 199 | 100 | 4 | 231 |
| 19 | 164 | 224 | 110 | 39 | 46 | 17 | 99 | 145 | 6 | 197 | 335 | 158 | 173 | 278 | 210 | 45 | 174 |
| 21 | 109 | 368 | 269 | 58 | 15 | 59 | 101 | 199 | 12 | 207 | 2 | 55 | 26 | 0 | 195 | 168 | 145 |
| 22 | 241 | 67 | 245 | 44 | 230 | 314 | 35 | 153 | 22 | 103 | 266 | 285 | 187 | 205 | 268 | 185 | 100 |
| 24 | 90 | 170 | 154 | 201 | 54 | 244 | 116 | 38 | 57 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 36 | 0 | 37 | 210 | 259 | 222 | 216 | 135 | 6 | 11 |
| 9 | 0 | 103 | 366 | 189 | 9 | 162 | 156 | 6 | 169 | 14 | 105 | 313 | 179 | 157 | 16 | 15 | 200 | 207 |
| 1 | 182 | 232 | 244 | 37 | 159 | 88 | 10 | 12 | 15 | 51 | 297 | 178 | 0 | 0 | 35 | 177 | 42 |
| 10 | 109 | 321 | 36 | 213 | 93 | 293 | 145 | 206 | 18 | 120 | 21 | 160 | 6 | 0 | 188 | 43 | 100 |
| 11 | 21 | 133 | 286 | 105 | 134 | 111 | 53 | 221 | 58 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 13 | 142 | 57 | 151 | 89 | 45 | 92 | 201 | 17 | 37 | 1 | 198 | 269 | 298 | 81 | 72 | 319 | 82 | 59 |
| 17 | 14 | 303 | 267 | 185 | 132 | 152 | 4 | 212 | 13 | 220 | 82 | 15 | 195 | 144 | 236 | 2 | 204 |
| 18 | 61 | 63 | 135 | 109 | 76 | 23 | 164 | 92 | 23 | 122 | 115 | 115 | 138 | 0 | 85 | 135 | 161 |
| 20 | 216 | 82 | 209 | 218 | 209 | 337 | 173 | 205 | 59 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 31 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 38 | 0 | 167 | 185 | 151 | 123 | 190 | 164 | 91 | 121 |
| 10 | 1 | 98 | 101 | 14 | 82 | 178 | 175 | 126 | 116 | 9 | 151 | 177 | 179 | 90 | 0 | 196 | 64 | 90 |
| 2 | 149 | 339 | 80 | 165 | 1 | 253 | 77 | 151 | 10 | 157 | 289 | 64 | 73 | 0 | 209 | 198 | 26 |
| 4 | 167 | 274 | 211 | 174 | 28 | 27 | 156 | 70 | 12 | 163 | 214 | 181 | 10 | 0 | 246 | 100 | 140 |
| 7 | 160 | 111 | 75 | 19 | 267 | 231 | 16 | 230 | 60 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8 | 49 | 383 | 161 | 194 | 234 | 49 | 12 | 115 | 39 | 1 | 173 | 258 | 102 | 12 | 153 | 236 | 4 | 115 |
| 14 | 58 | 354 | 311 | 103 | 201 | 267 | 70 | 84 | 3 | 139 | 93 | 77 | 77 | 0 | 264 | 28 | 188 |
| 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 149 | 346 | 192 | 49 | 165 | 37 | 109 | 168 |
| 11 | 0 | 77 | 48 | 16 | 52 | 55 | 25 | 184 | 45 | 19 | 0 | 297 | 208 | 114 | 117 | 272 | 188 | 52 |
| 1 | 41 | 102 | 147 | 11 | 23 | 322 | 194 | 115 | 61 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 12 | 83 | 8 | 290 | 2 | 274 | 200 | 123 | 134 | 40 | 0 | 157 | 175 | 32 | 67 | 216 | 304 | 10 | 4 |
| 16 | 182 | 47 | 289 | 35 | 181 | 351 | 16 | 1 | 8 | 137 | 37 | 80 | 45 | 144 | 237 | 84 | 103 |
| 21 | 78 | 188 | 177 | 32 | 273 | 166 | 104 | 152 | 17 | 149 | 312 | 197 | 96 | 2 | 135 | 12 | 30 |
| 22 | 252 | 334 | 43 | 84 | 39 | 338 | 109 | 165 | 62 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 23 | 22 | 115 | 280 | 201 | 26 | 192 | 124 | 107 | 41 | 1 | 167 | 52 | 154 | 23 | 0 | 123 | 2 | 53 |
| 33 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 173 | 314 | 47 | 215 | 0 | 77 | 75 | 189 |
| 12 | 0 | 160 | 77 | 229 | 142 | 225 | 123 | 6 | 186 | 9 | 139 | 139 | 124 | 60 | 0 | 25 | 142 | 215 |
| 1 | 42 | 186 | 235 | 175 | 162 | 217 | 20 | 215 | 18 | 151 | 288 | 207 | 167 | 183 | 272 | 128 | 24 |
| 10 | 21 | 174 | 169 | 136 | 244 | 142 | 203 | 124 | 63 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 11 | 32 | 232 | 48 | 3 | 151 | 110 | 153 | 180 | 42 | 0 | 149 | 113 | 226 | 114 | 27 | 288 | 163 | 222 |
| 13 | 234 | 50 | 105 | 28 | 238 | 176 | 104 | 98 | 4 | 157 | 14 | 65 | 91 | 0 | 83 | 10 | 170 |
| 18 | 7 | 74 | 52 | 182 | 243 | 76 | 207 | 80 | 24 | 137 | 218 | 126 | 78 | 35 | 17 | 162 | 71 |
| 34 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 64 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 13 | 0 | 177 | 313 | 39 | 81 | 231 | 311 | 52 | 220 | 43 | 1 | 151 | 113 | 228 | 206 | 52 | 210 | 1 | 22 |
| 3 | 248 | 177 | 302 | 56 | 0 | 251 | 147 | 185 | 16 | 163 | 132 | 69 | 22 | 243 | 3 | 163 | 127 |
| 7 | 151 | 266 | 303 | 72 | 216 | 265 | 1 | 154 | 18 | 173 | 114 | 176 | 134 | 0 | 53 | 99 | 49 |
| 20 | 185 | 115 | 160 | 217 | 47 | 94 | 16 | 178 | 25 | 139 | 168 | 102 | 161 | 270 | 167 | 98 | 125 |
| 23 | 62 | 370 | 37 | 78 | 36 | 81 | 46 | 150 | 65 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 35 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 44 | 0 | 139 | 80 | 234 | 84 | 18 | 79 | 4 | 191 |
| 14 | 0 | 206 | 142 | 78 | 14 | 0 | 22 | 1 | 124 | 7 | 157 | 78 | 227 | 4 | 0 | 244 | 6 | 211 |
| 12 | 55 | 248 | 299 | 175 | 186 | 322 | 202 | 144 | 9 | 163 | 163 | 259 | 9 | 0 | 293 | 142 | 187 |
| 15 | 206 | 137 | 54 | 211 | 253 | 277 | 118 | 182 | 22 | 173 | 274 | 260 | 12 | 57 | 272 | 3 | 148 |
| 16 | 127 | 89 | 61 | 191 | 16 | 156 | 130 | 95 | 66 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 17 | 16 | 347 | 179 | 51 | 0 | 66 | 1 | 72 | 45 | 1 | 149 | 135 | 101 | 184 | 168 | 82 | 181 | 177 |
| 21 | 229 | 12 | 258 | 43 | 79 | 78 | 2 | 76 | 6 | 151 | 149 | 228 | 121 | 0 | 67 | 45 | 114 |
| 36 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 167 | 15 | 126 | 29 | 144 | 235 | 153 | 93 |
| 15 | 0 | 40 | 241 | 229 | 90 | 170 | 176 | 173 | 39 | 67 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Table 5.3.2-3: LDPC base graph 2 () and its parity check matrices ()

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | |  | | | | | | | |  | |  | | | | | | | |
| Row  index | Column  index | Set index | | | | | | | | Row  index | Column  index | Set index | | | | | | | |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 0 | 0 | 9 | 174 | 0 | 72 | 3 | 156 | 143 | 145 | 16 | 26 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 117 | 97 | 0 | 110 | 26 | 143 | 19 | 131 | 17 | 1 | 254 | 158 | 0 | 48 | 120 | 134 | 57 | 196 |
| 2 | 204 | 166 | 0 | 23 | 53 | 14 | 176 | 71 | 5 | 124 | 23 | 24 | 132 | 43 | 23 | 201 | 173 |
| 3 | 26 | 66 | 0 | 181 | 35 | 3 | 165 | 21 | 11 | 114 | 9 | 109 | 206 | 65 | 62 | 142 | 195 |
| 6 | 189 | 71 | 0 | 95 | 115 | 40 | 196 | 23 | 12 | 64 | 6 | 18 | 2 | 42 | 163 | 35 | 218 |
| 9 | 205 | 172 | 0 | 8 | 127 | 123 | 13 | 112 | 27 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 18 | 0 | 220 | 186 | 0 | 68 | 17 | 173 | 129 | 128 |
| 11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 194 | 6 | 18 | 16 | 106 | 31 | 203 | 211 |
| 1 | 0 | 167 | 27 | 137 | 53 | 19 | 17 | 18 | 142 | 7 | 50 | 46 | 86 | 156 | 142 | 22 | 140 | 210 |
| 3 | 166 | 36 | 124 | 156 | 94 | 65 | 27 | 174 | 28 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4 | 253 | 48 | 0 | 115 | 104 | 63 | 3 | 183 | 19 | 0 | 87 | 58 | 0 | 35 | 79 | 13 | 110 | 39 |
| 5 | 125 | 92 | 0 | 156 | 66 | 1 | 102 | 27 | 1 | 20 | 42 | 158 | 138 | 28 | 135 | 124 | 84 |
| 6 | 226 | 31 | 88 | 115 | 84 | 55 | 185 | 96 | 10 | 185 | 156 | 154 | 86 | 41 | 145 | 52 | 88 |
| 7 | 156 | 187 | 0 | 200 | 98 | 37 | 17 | 23 | 29 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8 | 224 | 185 | 0 | 29 | 69 | 171 | 14 | 9 | 20 | 1 | 26 | 76 | 0 | 6 | 2 | 128 | 196 | 117 |
| 9 | 252 | 3 | 55 | 31 | 50 | 133 | 180 | 167 | 4 | 105 | 61 | 148 | 20 | 103 | 52 | 35 | 227 |
| 11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 11 | 29 | 153 | 104 | 141 | 78 | 173 | 114 | 6 |
| 12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 30 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | 0 | 81 | 25 | 20 | 152 | 95 | 98 | 126 | 74 | 21 | 0 | 76 | 157 | 0 | 80 | 91 | 156 | 10 | 238 |
| 1 | 114 | 114 | 94 | 131 | 106 | 168 | 163 | 31 | 8 | 42 | 175 | 17 | 43 | 75 | 166 | 122 | 13 |
| 3 | 44 | 117 | 99 | 46 | 92 | 107 | 47 | 3 | 13 | 210 | 67 | 33 | 81 | 81 | 40 | 23 | 11 |
| 4 | 52 | 110 | 9 | 191 | 110 | 82 | 183 | 53 | 31 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8 | 240 | 114 | 108 | 91 | 111 | 142 | 132 | 155 | 22 | 1 | 222 | 20 | 0 | 49 | 54 | 18 | 202 | 195 |
| 10 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 2 | 63 | 52 | 4 | 1 | 132 | 163 | 126 | 44 |
| 12 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 13 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 0 | 23 | 106 | 0 | 156 | 68 | 110 | 52 | 5 |
| 3 | 1 | 8 | 136 | 38 | 185 | 120 | 53 | 36 | 239 | 3 | 235 | 86 | 75 | 54 | 115 | 132 | 170 | 94 |
| 2 | 58 | 175 | 15 | 6 | 121 | 174 | 48 | 171 | 5 | 238 | 95 | 158 | 134 | 56 | 150 | 13 | 111 |
| 4 | 158 | 113 | 102 | 36 | 22 | 174 | 18 | 95 | 33 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 5 | 104 | 72 | 146 | 124 | 4 | 127 | 111 | 110 | 24 | 1 | 46 | 182 | 0 | 153 | 30 | 113 | 113 | 81 |
| 6 | 209 | 123 | 12 | 124 | 73 | 17 | 203 | 159 | 2 | 139 | 153 | 69 | 88 | 42 | 108 | 161 | 19 |
| 7 | 54 | 118 | 57 | 110 | 49 | 89 | 3 | 199 | 9 | 8 | 64 | 87 | 63 | 101 | 61 | 88 | 130 |
| 8 | 18 | 28 | 53 | 156 | 128 | 17 | 191 | 43 | 34 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 9 | 128 | 186 | 46 | 133 | 79 | 105 | 160 | 75 | 25 | 0 | 228 | 45 | 0 | 211 | 128 | 72 | 197 | 66 |
| 10 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 5 | 156 | 21 | 65 | 94 | 63 | 136 | 194 | 95 |
| 13 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 35 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4 | 0 | 179 | 72 | 0 | 200 | 42 | 86 | 43 | 29 | 26 | 2 | 29 | 67 | 0 | 90 | 142 | 36 | 164 | 146 |
| 1 | 214 | 74 | 136 | 16 | 24 | 67 | 27 | 140 | 7 | 143 | 137 | 100 | 6 | 28 | 38 | 172 | 66 |
| 11 | 71 | 29 | 157 | 101 | 51 | 83 | 117 | 180 | 12 | 160 | 55 | 13 | 221 | 100 | 53 | 49 | 190 |
| 14 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 13 | 122 | 85 | 7 | 6 | 133 | 145 | 161 | 86 |
| 5 | 0 | 231 | 10 | 0 | 185 | 40 | 79 | 136 | 121 | 36 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 41 | 44 | 131 | 138 | 140 | 84 | 49 | 41 | 27 | 0 | 8 | 103 | 0 | 27 | 13 | 42 | 168 | 64 |
| 5 | 194 | 121 | 142 | 170 | 84 | 35 | 36 | 169 | 6 | 151 | 50 | 32 | 118 | 10 | 104 | 193 | 181 |
| 7 | 159 | 80 | 141 | 219 | 137 | 103 | 132 | 88 | 37 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 11 | 103 | 48 | 64 | 193 | 71 | 60 | 62 | 207 | 28 | 1 | 98 | 70 | 0 | 216 | 106 | 64 | 14 | 7 |
| 15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 101 | 111 | 126 | 212 | 77 | 24 | 186 | 144 |
| 6 | 0 | 155 | 129 | 0 | 123 | 109 | 47 | 7 | 137 | 5 | 135 | 168 | 110 | 193 | 43 | 149 | 46 | 16 |
| 5 | 228 | 92 | 124 | 55 | 87 | 154 | 34 | 72 | 38 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7 | 45 | 100 | 99 | 31 | 107 | 10 | 198 | 172 | 29 | 0 | 18 | 110 | 0 | 108 | 133 | 139 | 50 | 25 |
| 9 | 28 | 49 | 45 | 222 | 133 | 155 | 168 | 124 | 4 | 28 | 17 | 154 | 61 | 25 | 161 | 27 | 57 |
| 11 | 158 | 184 | 148 | 209 | 139 | 29 | 12 | 56 | 39 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 30 | 2 | 71 | 120 | 0 | 106 | 87 | 84 | 70 | 37 |
| 7 | 1 | 129 | 80 | 0 | 103 | 97 | 48 | 163 | 86 | 5 | 240 | 154 | 35 | 44 | 56 | 173 | 17 | 139 |
| 5 | 147 | 186 | 45 | 13 | 135 | 125 | 78 | 186 | 7 | 9 | 52 | 51 | 185 | 104 | 93 | 50 | 221 |
| 7 | 140 | 16 | 148 | 105 | 35 | 24 | 143 | 87 | 9 | 84 | 56 | 134 | 176 | 70 | 29 | 6 | 17 |
| 11 | 3 | 102 | 96 | 150 | 108 | 47 | 107 | 172 | 40 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 13 | 116 | 143 | 78 | 181 | 65 | 55 | 58 | 154 | 31 | 1 | 106 | 3 | 0 | 147 | 80 | 117 | 115 | 201 |
| 17 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 13 | 1 | 170 | 20 | 182 | 139 | 148 | 189 | 46 |
| 8 | 0 | 142 | 118 | 0 | 147 | 70 | 53 | 101 | 176 | 41 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 94 | 70 | 65 | 43 | 69 | 31 | 177 | 169 | 32 | 0 | 242 | 84 | 0 | 108 | 32 | 116 | 110 | 179 |
| 12 | 230 | 152 | 87 | 152 | 88 | 161 | 22 | 225 | 5 | 44 | 8 | 20 | 21 | 89 | 73 | 0 | 14 |
| 18 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12 | 166 | 17 | 122 | 110 | 71 | 142 | 163 | 116 |
| 9 | 1 | 203 | 28 | 0 | 2 | 97 | 104 | 186 | 167 | 42 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8 | 205 | 132 | 97 | 30 | 40 | 142 | 27 | 238 | 33 | 2 | 132 | 165 | 0 | 71 | 135 | 105 | 163 | 46 |
| 10 | 61 | 185 | 51 | 184 | 24 | 99 | 205 | 48 | 7 | 164 | 179 | 88 | 12 | 6 | 137 | 173 | 2 |
| 11 | 247 | 178 | 85 | 83 | 49 | 64 | 81 | 68 | 10 | 235 | 124 | 13 | 109 | 2 | 29 | 179 | 106 |
| 19 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 43 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10 | 0 | 11 | 59 | 0 | 174 | 46 | 111 | 125 | 38 | 34 | 0 | 147 | 173 | 0 | 29 | 37 | 11 | 197 | 184 |
| 1 | 185 | 104 | 17 | 150 | 41 | 25 | 60 | 217 | 12 | 85 | 177 | 19 | 201 | 25 | 41 | 191 | 135 |
| 6 | 0 | 22 | 156 | 8 | 101 | 174 | 177 | 208 | 13 | 36 | 12 | 78 | 69 | 114 | 162 | 193 | 141 |
| 7 | 117 | 52 | 20 | 56 | 96 | 23 | 51 | 232 | 44 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 35 | 1 | 57 | 77 | 0 | 91 | 60 | 126 | 157 | 85 |
| 11 | 0 | 11 | 32 | 0 | 99 | 28 | 91 | 39 | 178 | 5 | 40 | 184 | 157 | 165 | 137 | 152 | 167 | 225 |
| 7 | 236 | 92 | 7 | 138 | 30 | 175 | 29 | 214 | 11 | 63 | 18 | 6 | 55 | 93 | 172 | 181 | 175 |
| 9 | 210 | 174 | 4 | 110 | 116 | 24 | 35 | 168 | 45 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 13 | 56 | 154 | 2 | 99 | 64 | 141 | 8 | 51 | 36 | 0 | 140 | 25 | 0 | 1 | 121 | 73 | 197 | 178 |
| 21 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 38 | 151 | 63 | 175 | 129 | 154 | 167 | 112 |
| 12 | 1 | 63 | 39 | 0 | 46 | 33 | 122 | 18 | 124 | 7 | 154 | 170 | 82 | 83 | 26 | 129 | 179 | 106 |
| 3 | 111 | 93 | 113 | 217 | 122 | 11 | 155 | 122 | 46 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 11 | 14 | 11 | 48 | 109 | 131 | 4 | 49 | 72 | 37 | 10 | 219 | 37 | 0 | 40 | 97 | 167 | 181 | 154 |
| 22 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 13 | 151 | 31 | 144 | 12 | 56 | 38 | 193 | 114 |
| 13 | 0 | 83 | 49 | 0 | 37 | 76 | 29 | 32 | 48 | 47 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 2 | 125 | 112 | 113 | 37 | 91 | 53 | 57 | 38 | 1 | 31 | 84 | 0 | 37 | 1 | 112 | 157 | 42 |
| 8 | 38 | 35 | 102 | 143 | 62 | 27 | 95 | 167 | 5 | 66 | 151 | 93 | 97 | 70 | 7 | 173 | 41 |
| 13 | 222 | 166 | 26 | 140 | 47 | 127 | 186 | 219 | 11 | 38 | 190 | 19 | 46 | 1 | 19 | 191 | 105 |
| 23 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 48 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 14 | 1 | 115 | 19 | 0 | 36 | 143 | 11 | 91 | 82 | 39 | 0 | 239 | 93 | 0 | 106 | 119 | 109 | 181 | 167 |
| 6 | 145 | 118 | 138 | 95 | 51 | 145 | 20 | 232 | 7 | 172 | 132 | 24 | 181 | 32 | 6 | 157 | 45 |
| 11 | 3 | 21 | 57 | 40 | 130 | 8 | 52 | 204 | 12 | 34 | 57 | 138 | 154 | 142 | 105 | 173 | 189 |
| 13 | 232 | 163 | 27 | 116 | 97 | 166 | 109 | 162 | 49 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 24 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 40 | 2 | 0 | 103 | 0 | 98 | 6 | 160 | 193 | 78 |
| 15 | 0 | 51 | 68 | 0 | 116 | 139 | 137 | 174 | 38 | 10 | 75 | 107 | 36 | 35 | 73 | 156 | 163 | 67 |
| 10 | 175 | 63 | 73 | 200 | 96 | 103 | 108 | 217 | 13 | 120 | 163 | 143 | 36 | 102 | 82 | 179 | 180 |
| 11 | 213 | 81 | 99 | 110 | 128 | 40 | 102 | 157 | 50 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 25 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 41 | 1 | 129 | 147 | 0 | 120 | 48 | 132 | 191 | 53 |
| 16 | 1 | 203 | 87 | 0 | 75 | 48 | 78 | 125 | 170 | 5 | 229 | 7 | 2 | 101 | 47 | 6 | 197 | 215 |
| 9 | 142 | 177 | 79 | 158 | 9 | 158 | 31 | 23 | 11 | 118 | 60 | 55 | 81 | 19 | 8 | 167 | 230 |
| 11 | 8 | 135 | 111 | 134 | 28 | 17 | 54 | 175 | 51 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 12 | 242 | 64 | 143 | 97 | 8 | 165 | 176 | 202 |  |  |  |  |  |  |  |  |  |  |