Hand-in problems 4 for TSTE18 Digital Arithmetic

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The solutions to the hand-in problems should be submitted at most one week after the corresponding seminar to result in prioritized corrections.

These problems should be solved on an **individual** basis. Each student has a consecutive number assigned during the first seminar (or through email contact with the examiner) and should solve the problems using the corresponding data.

Note that the problems should be solved **"by hand"**. Hence, you will need to provide some evidence that you actually solved the problem and not just ran some software for it.

On each sheet of paper write name, personal id number, and student-id, as well as the consecutive number assigned to you.

1 Booth-encoding

Encode the following numbers using radix-4 modified Booth encoding, by first encoding them as two's complement and then apply the encoding algorithm.

Student no.	Number 1	Number 2
1	832	−239
2	542	−342
3	443	−707
4	264	−362
5	289	−287
6	405	−903
7	535	−475
8	272	−983
9	478	−871
10	665	−450
11	900	−817
12	529	−844
13	920	−497
14	412	−648
15	923	−743
16	451	−772
17	970	−600
18	597	−391
19	175	−275
20	195	−528

2 Booth-encoding logic

Derive Boolean expressions for the control signals multiply by 2, negative, and zero on page 13 of the seminar slides based on the three coefficient bits to be encoded.

3 Dot diagram reduction

Perform reduction of the partial products resulting from a 7×7 bits unsigned multiplication such that at most two partial products are present in each column of the output. Show the results similar to the seminar examples.

4 Signed multiplication

Derive the partial product array for a 3×5 bits two's complement multiplication using the modified Baugh-Wooley technique, i.e., utilizing that $-b = \bar{b} - 1$.