For questions, refer to the Quiz page. Only the solutions are given below.

Q1: The de-multiplexer takes one single input data line and then switches it to any one of output lines one at a time. This is same when we use decoder with enable. The input data line is the enable. So whatever data is in enable is passed on to one of the outputs.
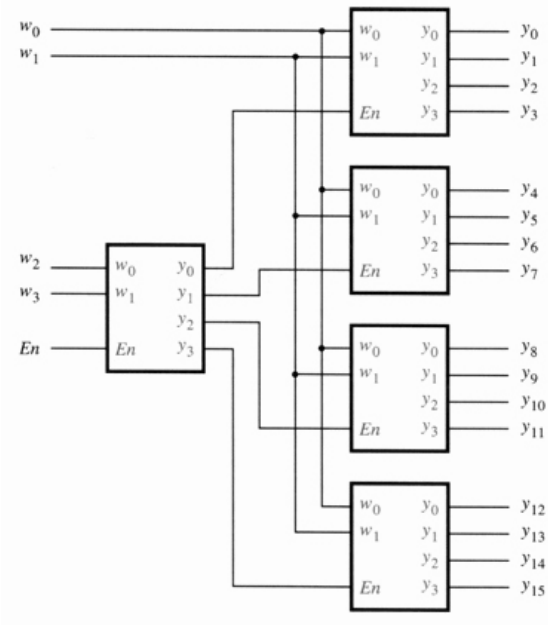
Answer : C

Q2: Remember, the question explicitly said that only the uncomplemented inputs are available. Hence B' is not freely available for XNOR, it has to be made using a mux.
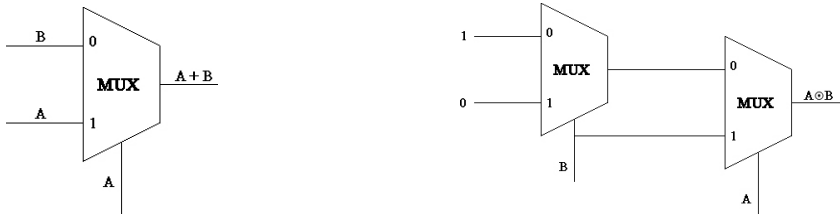
Answer : C

Q3:

Answer : C

Q4: Answer : A

Q5:

Level	Decoders	Output Enable
1	1	16
2	16	256
3	256	4096
4	4096	65536

Every level has 4 inputs making altogether 16 inputs.

Total number of decoders is 1 + 16 + 256 + 4096 = 4369

Q6:

Binary Inputs				Decoder Outputs							7-Segment Display Outputs
D	C	B	A	a	b	c	d	e	f	g	
0	0	0	0	1	1	1	1	1	1	0	0
0	0	0	1	0	1	1	0	0	0	0	1
0	0	1	0	1	1	0	1	1	0	1	2
0	0	1	1	1	1	1	1	0	0	1	3
0	1	0	0	0	1	1	0	0	1	1	4
0	1	0	1	1	0	1	1	0	1	1	5
0	1	1	0	1	0	1	1	1	1	1	6
0	1	1	1	1	1	1	0	0	0	0	7
1	0	0	0	1	1	1	1	1	1	1	8
1	0	0	1	1	1	1	1	0	1	1	9

CD AB→ ↓	00	01	11	10
00	1	1	1	0
01	1	0	0	1
11	0	0	0	0
10	0	1	1	1

Answer : A

Q7: Enable is 0 hence all values are 0

Answer : D

Q8: The question is asking for Shannon's expansion on two variables. If we pick out x1, x2, all 4 combinations of x1, x2 must occur with the appropriate co-factor (which reflects whether complemented or uncomplemented version of x1, x2 are chosen). For example, for the x1x2' term, the cofactor must have x1=1 and x2=0.
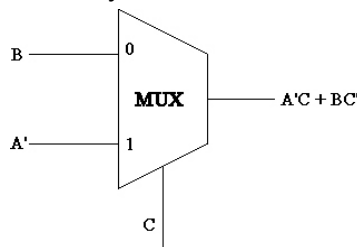
Answer : A

Q9: Try Shannon's expansion with all three variables, a, b and c.
F = a'c + bc'

Using a, F = a(bc') + a'(bc'+c) = a(bc') + a'(b+c) This requires one inverter, one AND and one OR gate on top of a 2:1 mux.

Using b, F = b(c'+a'c) + b'(a'c) = b(a'+c) + b'(a'c) This also requires one inverter, one AND and one OR gate on top of a 2:1 mux.

Using c, F = c(a') + c'(b) which needs only one inverter and 2:1 mux.

Answer: 0,0,1