# ESC 201 : Introduction to Electronics

## Assignment 11 solutions

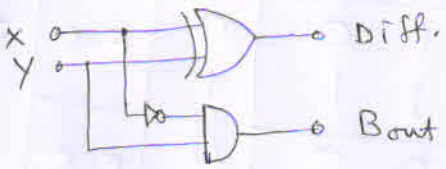
**Ans 1**

Half Subtractor Truth table

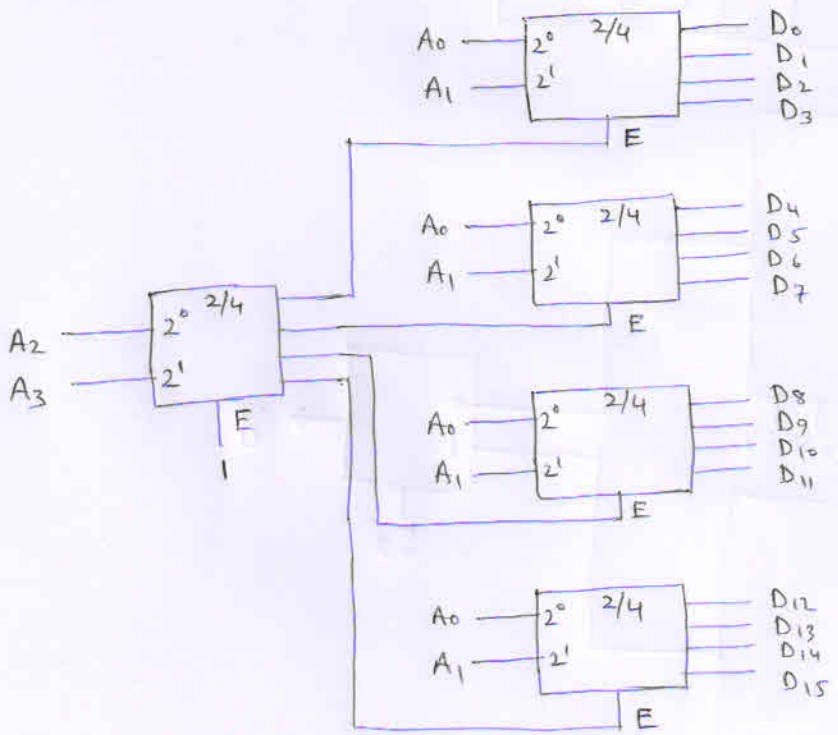
| Input | | Output | |
|---|---|---|---|
| X | Y | Diff. | Bout |
| 0 | 0 | 0 | 0 |
| 0 | 1 | 1 | 1 |
| 1 | 0 | 1 | 0 |
| 1 | 1 | 0 | 0 |

$Diff. = X \oplus Y$

$Bout = \bar{X} \cdot Y$

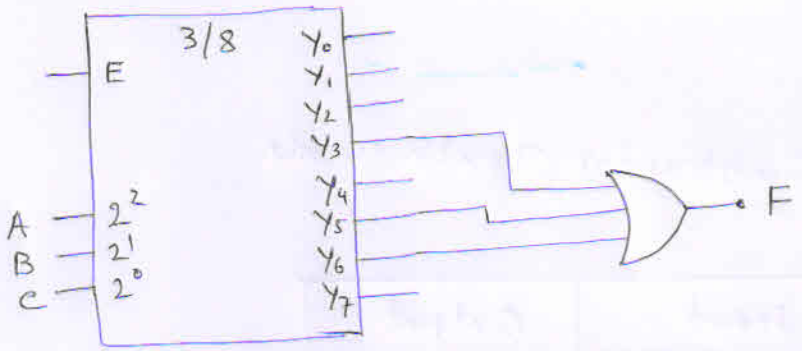



**Ans. 2**



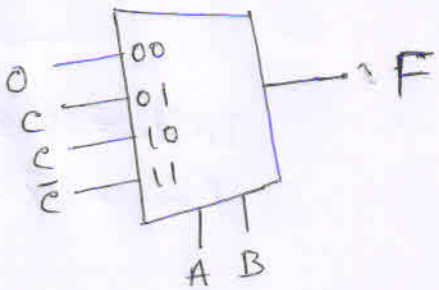

4 to 16 decoder using five 2 to 4 decoder.

Ans 3.(i) $F(A,B,C) = \sum(3,5,6)$ using decoder:

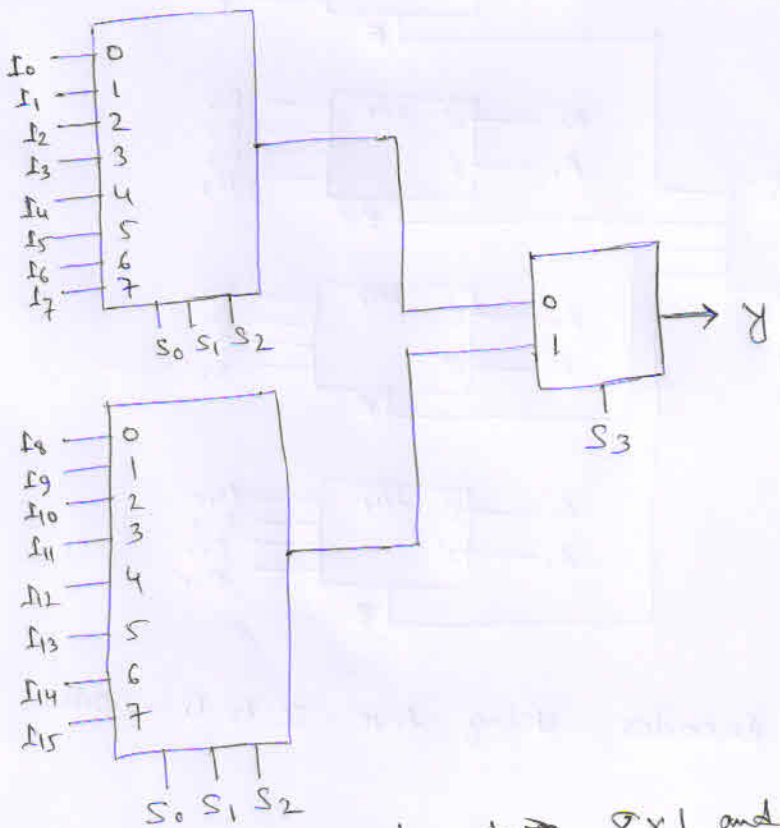



3.(ii) $F(A,B,C) = \sum(3,5,6)$ using multiplexer:

| A | B | C | F | |
|---|---|---|---|---|
| 0 | 0 | 0 | 0 | F=0 |
| 0 | 0 | 1 | 0 | |
| 0 | 1 | 0 | 0 | F=C |
| 0 | 1 | 1 | 1 | |
| 1 | 0 | 0 | 0 | F=C |
| 1 | 0 | 1 | 1 | |
| 1 | 1 | 0 | 1 | $F=\bar{C}$ |
| 1 | 1 | 1 | 0 | |



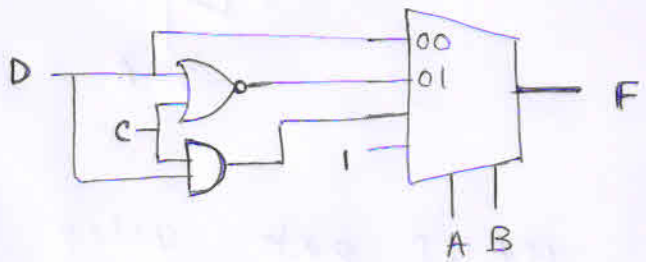

4



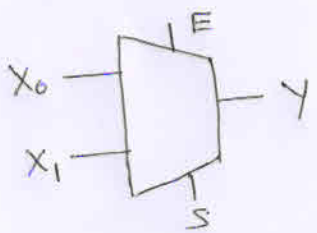

16×1 multiplexer using two 8×1 and one 2×1 multiplexer

Ans 5 $F(A, B, C, D) = \sum(1, 3, 4, 11, 12, 13, 14, 15)$

| AB | CD | F | |
|---|---|---|---|
| 00 | 00 | 0 | |
| 00 | 01 | 1 | $F = D$ |
| 00 | 10 | 0 | |
| 00 | 11 | 1 | |
| 01 | 00 | 1 | |
| 01 | 01 | 0 | $F = \bar{C}\bar{D}$ |
| 01 | 10 | 0 | |
| 01 | 11 | 0 | |
| 10 | 00 | 0 | |
| 10 | 01 | 0 | $F = CD$ |
| 10 | 10 | 0 | |
| 10 | 11 | 1 | |
| 11 | 00 | 1 | |
| 11 | 01 | 1 | $F = 1$ |
| 11 | 10 | 1 | |
| 11 | 11 | 1 | |

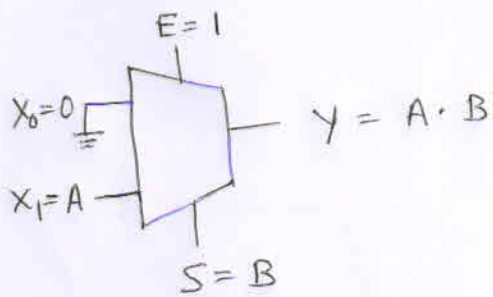



Ans-6 2 to 1 mux

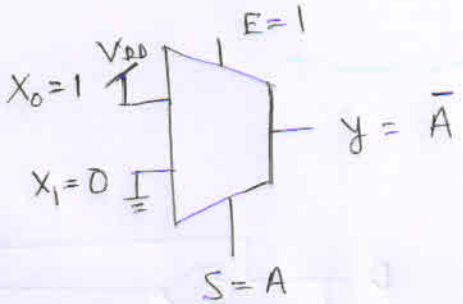



$$Y = X_0 \cdot \bar{S} + X_1 \cdot S$$

(i) AND gate using 2 to 1 MUX



(ii) NOT gate using 2 to 1 mux




(iii) NAND gate using two 2 to 1 mux