

Answers 3B2 –2005 –

1.

(b) $Q_0^+ = Q_2Q_1 + \overline{Q_2}\overline{Q_1}$
 $Q_1^+ = \overline{Q_2}\overline{Q_1}Q_0 + \overline{Q_2}Q_1 + \overline{Q_0}Q_1$
 $Q_2^+ = Q_1\overline{Q_0}\overline{Q_2} + Q_1Q_2 + Q_0Q_2$

Present state	Next state
000	001
001	011
011	010
010	110
110	111
111	101
101	100
100	000
000	

(c) 3-bit Gray code counter

2.

(c)

Present state	Light outputs						Trigger outputs	
	MR	MY	MG	SR	SY	SG	Long	Short
00	0	0	1	1	0	0	1	0
01	0	1	0	1	0	0	0	1
10	1	0	0	0	0	1	1	0
11	1	0	0	0	1	0	0	1

3.

(b) $V_{out} = 1.61 V$

(c) $I_C = 1.63 mA, I_B = 163 \mu A, V_B = 1.52 V$

4. (a) $V_{OH} = -0.9 V, V_{OL} = -2.1 V, R_E = 860 \Omega, R_1 = 260 \Omega, I_{E2} = 4.2 mA, R_2 = 309 \Omega$

(c) $V_{IH} = -1.425 V, V_{IL} = -1.575 V, NM_H = 0.525 V, NM_L = 0.525 V$

(d) $I_{E4} = 102 \mu A, I_{B4} = 2 \mu A$

(e) 80 gates