5.6

(a)

$$t = \frac{b_2 - 0}{se(b_2)} = \frac{3-0}{2} = 1.5 \qquad t_{(0.05,\,60)} = 2.003$$

At the 5% significance level, fail to reject the null hypothesis.

$\beta_1 = 2 \quad \beta_2 = 3$

(b)

$H_0: \beta_1 + 2\beta_2 = 5$

$H_1: \beta_1 + 2\beta_2 \neq 5$

$Var(b_1) = 3$

$Var(b_2) = 4$

$Cov(b_1, b_2) = -2$

$$Var(b_1 + 2b_2) = 1^2 Var\, b_1 + 2^2 Var\, b_2 + 2 \times 2\, Cov(b_1, b_2)$$

$$= 3 + 16 + (-8) = 11$$

$$t = \frac{2 + 2 \times 3 - 5}{\sqrt{11}} = \frac{3}{\sqrt{11}} = 0.9045 < 2.003$$

Not reject H_0

(C)

$H_0 = \beta_1 - \beta_2 + \beta_3 = 4$

$H_1 = \beta_1 - \beta_2 + \beta_3 \neq 4$

$Var(\beta_1 - \beta_2 + \beta_3) = 3 + 4 + 3 - 2\times(-2) - 2\times 0 + 2\times 1$
$= 16$

$(\beta_1 - \beta_2 + \beta_3)(\beta_1 - \beta_2 + \beta_3)$

$= c_1^2\beta_1 - c_2^2\beta_2 + c_3^2\beta_3 - \beta_1\beta_2 + \beta_1\beta_3$
$- \beta_1\beta_2 - \beta_2\beta_3 + \beta_1\beta_3 - \beta_2\beta_3$

$= \overset{(Var)}{c_1^2\beta_1} - \overset{(Var)}{c_2^2\beta_2} + \overset{(Var)}{c_3^2\beta_3} - \overset{(cov)}{2\beta_1\beta_2} - \overset{(cov)}{2\beta_2\beta_3} + \overset{(cov)}{2\beta_1\beta_3}$

$t = \dfrac{(2 - 3 + 1) - 4}{\sqrt{16}} = -1.3$

$-1.5 < -2.003$

Not to reject H_0.