PAGE NO.:
DATE: / /

(c)

$$R = -\int_{W_0}^{W_1} \frac{V}{C_t T}\, dW$$

(Taken from Notes)

$$\rightarrow -\int_{W_0}^{W_1} \frac{V}{C_t} \times \frac{C_L}{C_D} \times \frac{dW}{W}$$

(Constant)

$C_t \rightarrow$ TSFC.

$\alpha \rightarrow$ Const ; $C_L, C_D \rightarrow$ Const

$$\Rightarrow W_0 = W$$

$$\Rightarrow W_1 = W - W_f$$

$$R = -\frac{V C_L}{C_t C_D} \int_{W_0}^{W_1} \frac{dW}{W}$$

$$\Rightarrow -\frac{V C_L}{C_t C_D} \times \ln\left(\frac{W_1}{W_0}\right)$$

$$\boxed{R \Rightarrow \frac{V C_L}{C_t C_D} \times \ln\left(\frac{W_0}{W_1}\right)}$$

(d) for R = 100 km

$$\left(\frac{C_L}{C_D}\right)_{max} \Rightarrow \frac{1}{2\sqrt{K C_{D_0}}}$$

$$10^5 \Rightarrow \frac{(0.7)(V_{cruise})}{(0.7)*} \times \left(\frac{1}{2\sqrt{K C_{D_0}}}\right) \times \ln\left(\frac{10000}{W_1}\right)$$

$$10^5 = 343 \times \frac{1}{2\sqrt{\frac{C_{D_0}}{\pi \epsilon AR}}} \times \ln\left(\frac{10000}{W_1}\right)$$

$$2 \times 10^5 \Rightarrow \left(343 \times \sqrt{\frac{\pi \epsilon AR}{C_{D_0}}}\right) \times \ln\left(\frac{10000}{W_1}\right)$$

$$\ln\left(\frac{W_1}{10000}\right) = -\frac{2 \times 10^5}{343} \times \sqrt{\frac{C_{D_0}}{\pi \epsilon AR}}$$