a. Taking logarithms of both sides of the Cobb-Douglas production function, we get

$$\ln Q_t = \alpha + \beta \ln K_t + \gamma \ln L_t + u_t$$

b. Let $\alpha = \alpha_1 + \alpha_2 t, \beta = \beta_1 + \beta_2 t$, and $\gamma = \gamma_1 + \gamma_2 t$. Substituting these in the basic model, we obtain the unrestricted model.

$$\ln Q_t = \alpha_1 + \alpha_2 t + \beta_1 \ln K_t + \beta_2 (t \ln K_t) + \gamma_1 \ln L_t + \gamma_2 \ln (t L_t) + v_t$$

c. The variables to be generated are: $\ln Q_t, \ln K_t, \ln L_t, t \ln K_t$, and $t \ln L_t$.

d. The null hypothesis is $\alpha_2 = \beta_2 = \gamma_2 = 0$. The alternative is that at least one of these coefficients is not zero.

e. The test statistic is $F_c = \dfrac{(ESSR - ESSU)/3}{ESSU/(46-6)}$, where ESSR and ESSU are the error sums of squares for the restricted and unrestricted models, respectively.

f. Under the null F_c has the F-distribution with 3 d.f. for the numerator and 40 d.f. for the denominator.

g. The critical value is $F^*_{3,40}(0.05) = 2.84$.

h. Reject the null hypothesis if $F_c > 2.84$.