Problem 2

a) Is the estimated multiple linear regression model of **Sleep** with all variables listed in Problem 1 statistically significant at $\alpha = 0.01$? (State the relevant hypothesis test, rejection rule and your conclusion)

b) Compute r^2 of the multiple linear regression model and **interpret it**.

c) Which two predictors are most highly correlated with each other? Which two explanatory variables exhibit the smallest correlation?

d) Fill in an empty cell (Sleep/Female) in the correlation matrix.

e) Consider simple regressions of Sleep on each explanatory variable. Identify predictor(s) that are statistically significant at $\alpha = 0.05$ in the simple regressions but are not statistically significant at $\alpha = 0.05$ in the multiple regression. Give a reason for their lack of statistical significance in the multiple regression.

f) Before fitting the multiple regression models the students hypothesized that for every one cups increase in **CoffeeCups,** the expected decrease in **Sleep** is 0.4 of an hour. Based on the estimated model were they correct? Answer by constructing an appropriate 95% confidence interval or by using a hypothesis test with $\alpha = 0.05$.

g) They also thought that the average sleep time in the population of NYU undergraduate student is more that 7 hours. Is there evidence in the data, at $\alpha = 0.05$ that they were right? (State the hypothesis test, rejection rule and your conclusion)

Minitab output for problems 1 and 2

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The regression equation is
Sleep = 6.62 - 0.708 Female


Predictor      Coef  SE Coef      T      P
Constant     6.6250   0.2201  30.11  0.000
Female      -0.7083   0.3112


S = 1.07802   R-Sq = 10.1%   R-Sq(adj) = 8.2%
```

Descriptive Statistics: Sleep

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Variable   N  N*   Mean  SE Mean  StDev  Minimum     Q1  Median     Q3  Maximum
Sleep     48   0  6.271    0.162  1.125    4.000  5.250   6.000  7.000    9.000




The regression equation is
Sleep = 5.94 + 0.0173 Age + 0.227 Study - 0.122 Extra - 0.583 Female
        - 0.301 Cupscoffee


Predictor      Coef  SE Coef      T      P
Constant     5.9399   0.9384   6.33  0.000
Age         0.01734  0.04436   0.39  0.698
Study       0.22737  0.07882   2.88  0.006
Extra       -0.1215   0.1231  -0.99  0.329
Female      -0.5826   0.2757  -2.11  0.041
Cupscoffee  -0.3009   0.1060  -2.84  0.007


S = 0.919914


Analysis of Variance

Source           DF       SS      MS      F      P
Regression        5            4.7874   5.66
Residual Error   42            0.8462
Total            47  59.4792




The regression equation is
Sleep = 5.98 + 0.227 Study - 0.377 Cupscoffee


Predictor      Coef  SE Coef      T      P
Constant     5.9755   0.3433  17.41  0.000
Study       0.22720  0.07493   3.03  0.004
Cupscoffee  -0.3765   0.1015  -3.71  0.001


S = 0.957993   R-Sq = 30.6%   R-Sq(adj) = 27.5%
```

Correlations: Sleep, Age, Study, Extra, Cupscoffee, Female

	Sleep	Age	Study	Extra	Cupscoffee
Age	0.256				
	0.079				
Study	0.306	0.373			
	0.035	0.009			
Extra	-0.290	-0.167	0.090		
	0.045	0.256	0.542		
Cupscoffee	-0.405	0.004	0.163	0.387	
	0.004	0.977	0.268	0.007	
Female		-0.155	0.089	0.156	0.166
		0.293	0.547	0.288	0.259

Cell Contents: Pearson correlation
              P-Value