King Saud University	First Mid-Term Test
College of Science	First Term 1428/29
Department of Stat. & O.R.	Open Book/ Two Hours

Use the following minitab output to answer the questions that follow:

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The regression equation is
Y = - 9.68 + 0.220 x1 + 0.232 x2 + 0.141 x3

Predictor      Coef  SE Coef      T      P
Constant     -9.675    1.410  -6.86  0.000
x1          0.21996  0.03094   7.11  0.000
x2          0.23152  0.07077   3.27  0.005
x3          0.14059  0.02726   5.16  0.000

S = 0.919664   R-Sq = 94.2%   R-Sq(adj) = 93.0%

Analysis of Variance

Source          DF       SS      MS      F      P
Regression       3  205.103  68.368  80.83  0.000
Residual Error  15   12.687   0.846
Total           18  217.789

Source  DF   Seq SS
x1       1  160.371
x2       1   22.230
x3       1   22.501
```

$(X'X)^{-1}$

```
 2.3506498  -0.0396869   0.0212390  -0.0142564
-0.0396869   0.0011322  -0.0016812   0.0000528
 0.0212390  -0.0016812   0.0059215  -0.0007083
-0.0142564   0.0000528  -0.0007083   0.0008784
```

a) Write down the fitted model.

b) Test using this model, and with $\alpha = .001$

$$H_0 : \beta_1 = \beta_2 = \beta_3 = 0 \quad \text{vs.} \quad H_1 : Not \quad all \quad \beta_i = 0, \quad i = 1,2,3$$

c) Find 93% joint confidence interval for $\beta_1, \beta_2, and \beta_3$.

d) Find the shortest 94% simultaneous prediction intervals for the independent variables:

X_1	52	48	50
X_2	13	12	17
X_3	21.5	15	32.5

e) Test for the model $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon$:

i) $H_0 : \beta_3 = 0$ vs. $H_1 : \beta_3 \neq 0$ with $\alpha = 0.01$, and find the p-value.

ii) $H_0 : \beta_2 = \beta_3 = 0$ vs. $H_1 : Not \quad all \quad \beta_i = 0, \quad i = 2,3$ with $\alpha = 0.01$, and find the p-value.

f) Find the coefficient of partial determination between Y and X_3 given that X_1 and X_2 are already in the model. Interpret your result.

Ended