This examination consists of two sections, each potentially worth 50 points. The first section consists of four problems. You are to answer three of the four, each problem is worth 16.66667 points. Problems should be answered as completely as you are able. Partial credit on problems is only possible if I can locate errors in your calculations; neatness and organization of your answers is essential. Remember, answer only three of the four problems, if you chose to answer all, I will select the three with the lowest scores. The second is the essay evaluating the article attached with this examination.
Part 1: (50 Points)

1. The midterm included the following problem.

“The saying, "penny wise and pound foolish" may apply to human resources as well as the balance of ones life. Consider rules that guide HR departments to limit the number of interviews so that they achieve fixed hire to interview ratios. Although such ratios may make sense for relatively homogeneous positions, for example a clerical, they make less sense for professional positions where the individuals fit with their co-workers will be critical to their effectiveness.

We consider the effectiveness of such rules by considering five offices of a firm which hires technical sales workers. The firm has a rule that there should be no more than 6 interviews per hire but provides some latitude if locations have trouble locating the sales workers they believe are appropriately skilled and who fit the office. We have data on the net revenue of each office, the difference between sales and expenditures from a one year sample of each office.”

<table>
<thead>
<tr>
<th>Location</th>
<th>Average Number of Interviews per Hire</th>
<th>Net Earnings in the Last Year (in $100,000.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>17</td>
</tr>
<tr>
<td>3</td>
<td>7</td>
<td>34</td>
</tr>
<tr>
<td>4</td>
<td>9</td>
<td>54</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

A. Taking net earnings last year as the dependent variable and the average number of interviews per hire as the explanatory variable, calculate the slope coefficient and intercept for the regression model.
Regression Calculations for the Final:

<table>
<thead>
<tr>
<th>X</th>
<th>Y</th>
<th>(X - XBar)</th>
<th>(X - Xbar)^2</th>
<th>(Y - Ybar)</th>
<th>(Y - YBAR)^2</th>
<th>(x-xbar)*(y-ybar)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>5</td>
<td>-0.8</td>
<td>0.64</td>
<td>-18</td>
<td>324</td>
<td>14.4</td>
</tr>
<tr>
<td>3</td>
<td>17</td>
<td>-2.8</td>
<td>7.84</td>
<td>-6</td>
<td>36</td>
<td>16.8</td>
</tr>
<tr>
<td>7</td>
<td>34</td>
<td>1.2</td>
<td>1.44</td>
<td>11</td>
<td>121</td>
<td>13.2</td>
</tr>
<tr>
<td>9</td>
<td>54</td>
<td>3.2</td>
<td>10.24</td>
<td>31</td>
<td>961</td>
<td>99.2</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>-0.8</td>
<td>0.64</td>
<td>-18</td>
<td>324</td>
<td>14.4</td>
</tr>
</tbody>
</table>

sum = 29  115
sum = 20.8
sum = 1766  158
avg = 5.8  23

slope coefficient = 158/20.8 = 7.596

intercept = 23 - 7.596 * 5.8 = -21.058

B. What is the impact of an additional interview on net earnings in the prior year? What is the prediction of net earnings when the average number of interviews per hire is 0? Why shouldn’t the answer to this question bother us? Should the firm loosen its policy on the acceptable number of interviews per hire?

Every additional interview increases net revenue by $759,600. The predicted net revenue when the number of interviews per hire is negative $2,105,800. This is the intercept of the model. The negative value of the intercept shouldn’t bother us because, first, the intercept is calculated to assure that the regression line goes through the point of means (that the error term is zero on average). Second, it is obviously outside of what we are ever going to experience - - we are unlikely to have a hiring process that never hires anyone. This model suggests, given the positive relationship between the number of interviews per hire and net revenue, we get better personnel and greater revenue, if we do additional interviewing. A significance test would, of course, be appropriate to test this conclusion for the population.
2. A consultant has offered us a time management program that, he claims, will improve the productivity of sales workers. His argues that many sales workers do not organize their work time well and, as a result, do not accomplish as much as they might in a given period. He proposes to run a pilot on 100 sales workers. He will provide a two day training session for free and we will monitor their productivity for 30 business days thereafter. He claims that we will see a substantial improvement in their performance as measured by value of sales for those who have taken the training.

We accept the challenge and have the sales workers take the training. We then monitor their sales (and the sales of the 200 sales workers who were not put through the program) closely over the following thirty days. We collect the data and estimate a model of value of sales in which value of sales is affected by the number of days the sales worker was working (some have vacation time or were ill), whether the sales worker worked in person to person or telephone sales, and whether they have been through the training program. We expect that sales will be higher for those who work more days and for those in person to person sales. We also expect that, if the consultant is correct, those who have been through the training program will sell more.

The variables in our model are:

Sales  The dollar value of individuals sales in the thirty days of the test period.

Days  The number of days worked during the thirty day test period

Person  An indicator variable for person to person sales. Takes on a value of 1 when the person is in person to person sales, 0 for those in telephone sales.

Training  An indicator variable with 1 indicating those who have had the training and 0 indicating those who have not had the training.

A. State the null and alternative hypotheses for these models.

\[ H_0 \text{ for training: } \beta_{\text{training}} \leq 0 \]
\[ H_a \text{ for training: } \beta_{\text{training}} > 0 \]

\[ H_0 \text{ for Days: } \beta_{\text{days}} \leq 0 \]
\[ H_a \text{ for Days: } \beta_{\text{days}} > 0 \]

\[ H_0 \text{ for Person: } \beta_{\text{person}} \leq 0 \]
\[ H_a \text{ for Person: } \beta_{\text{person}} > 0 \]
The estimated model is

\[
\text{Sales} = 4,500 + 3,024\times \text{Days} + 15,020\times \text{Person} + 23,000\times \text{Training}
\]

\[
(2487) \quad (1401) \quad (13650) \quad (9832)
\]

\[
N = 300 \quad r^2 = 45.00 \quad r^2 = 42.05
\]

Standard Error in ( )

B. Test the null hypothesis for each coefficient determining whether it is possible to reject the null in a 10%, 5% or 1% test. Do these results support our consultants contention about the training program?

<table>
<thead>
<tr>
<th>t-statistics</th>
<th>Null</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Training</strong></td>
<td>2.34</td>
</tr>
<tr>
<td><strong>Days</strong></td>
<td>2.15</td>
</tr>
<tr>
<td><strong>Person</strong></td>
<td>1.100</td>
</tr>
</tbody>
</table>

The coefficient on training is positive, large in magnitude, employees with training are $23,000 more than otherwise similar employees without the training, and rejects the null that training has no effect in better than a 1% test. The r-square and r-square-adjusted are not too shoddy, more than 40% of the variance of sales is being explained by these three explanatory variables.
A bright young HR employee, a recent graduate from the SLIR at MSU, has recently rotated into our group. We ask her to look over the model and comment on it. She suggests that, although the results for the training program are impressive, we might want to “control” for individuals prior ability. She argues that last year's average 30 day sales is a good measure of sales workers ability prior to taking the training. You obtain this information for the sales workers and re-estimate the model. The new model is:

\[
\text{Sales} = 2,501 + 2,621 \times \text{Days} + 18,020 \times \text{Person} + 4,500 \times \text{Training} + 1.04 \times \text{Prior Sales} \\
(1250) \quad (1316) \quad (10900) \quad (3460) \quad (0.043)
\]

\[
N = 300 \quad r^2 = 54.00 \quad r^2_{\text{adjusted}} = 52.15
\]

C. Is this equation a better equation than the prior equation, explain your answer in detail. Given these results, would you change your view of the consultants program?

<table>
<thead>
<tr>
<th>t-statistics</th>
<th>Null</th>
</tr>
</thead>
<tbody>
<tr>
<td>Training</td>
<td>1.30</td>
</tr>
<tr>
<td>Days</td>
<td>1.99</td>
</tr>
<tr>
<td>Person</td>
<td>1.65</td>
</tr>
<tr>
<td>Prior Sales</td>
<td>2.42</td>
</tr>
</tbody>
</table>

In this instance we find (1) the prior sales variable is correctly signed and easily rejects the null in all tests. Further, the result for person is more in line with what we expected, its positive and significant in a 10% and 5% test. The r-square and r-square adjusted measures are also improved. This equation seems better than the prior equation. However, the impact of the training program is greatly diminished and it only rejects the null in a 10% test. The case for the program is weaker than in the prior estimate.
3. You are interested in the impact of diversity programs on research and development teams throughout your organization. Theory indicates that diversity in work groups leads to innovation because it couples diverse perspectives and backgrounds and learning occurs. Your organization is a large multinational corporation managing over 200 product lines under 25 brands. There are 25 R&D teams, one per brand.

You measure innovation in each team as the number of new products developed in that team per year. You measure diversity as a simple count of the number of cultural backgrounds represented in a given work team (more diverse teams have higher counts).

Your regression model is:

\[ I_i = \alpha + \beta_1 D_i + \beta_2 T_i + \beta_3 R_i + \epsilon_i \]

Where:
- “I” is innovation (number of new product developed per year for the ith team)
- “D” is diversity (number of cultural backgrounds represented in the ith team)
- “T” is talent (average years of education in the ith team)
- “R” is resources (annual budget for the ith team in thousands of dollars)

A. Set up the null and alternative hypotheses to test your expectations about the relationship between diversity and innovation.

B. Briefly explain why it is important to include training and resources in the regression when you are interested in the effect of team diversity on innovation?
You collect data from all 25 R&D teams and use it to run the regression above. (Figures in parentheses are standard errors)

\[ I_i = 0.04 - 0.2D + 0.01T + 0.6R \]

\[ (0.06) \quad (0.005) \quad (0.10) \]

C. Interpret the coefficients on D, T and R

D. What is the effect of a $200 increase in resources on innovation?

E. Run the hypothesis test you set up in part A and evaluate H_0 at 10%, 5% and 1% confidence levels.
4. Your firm has recently become concerned with work life issues. You feel that your employees are having a hard time balancing their work life and family or personal lives and this is increasing absenteeism. To help reduce work life conflict, your organization has decided that it would like to experiment with two work life programs. Specifically your organization is interested in implementing one of the following programs: flex time, teleworking or job sharing. You have total of 160 offices throughout the continental U.S. and the director of H.R. has decided to pilot the programs in the following way:

20 offices will introduce flex time
20 offices will introduce teleworking
20 offices will introduce job sharing
20 offices will introduce flex time and teleworking
20 offices will introduce flex time and job sharing
20 offices will introduce teleworking and job sharing
20 offices will introduce all three work life programs
20 offices will not introduce any work life programs

To determine which program is most effective in reducing absenteeism, you will estimate the following model:

\[ A_i = \alpha + \beta_1 F_i + \beta_2 T_i + \beta_3 J_i + \epsilon_i \]

Where “A” is absentee rate at the “ith” office (measured in average number of absences per day) and F, T and J are dummy variables for flex time, teleworking and job sharing, which take on the value of 1 if office i has introduced that program and 0 otherwise.

You gather data on all 160 offices and run the regression to obtain: (figures in parentheses are t stats)

\[ A_i = 2.3 + 0.5F - 2.3T + 3.0J \]

\[ (0.67) \quad (-2.15) \quad (3.33) \]

A. Interpret the coefficients on F, T and J?
B. What is the absenteeism rate for an office that has none of these programs in place?

C. What is the estimate of the absenteeism rate for an office that implements flextime and job sharing?

D. Conduct an appropriate hypothesis test for the coefficient on flex time.
Part B: Essay (50 points)

Applying what you have learned in this course, describe and review “Are Salaried Workers Compensated for Overtime Hours,” by Monica Cherry (Journal of Labor Research, Summer 2004). The essay should review the issues addressed by the article and the hypotheses tested; the appropriateness of the data to the topic, the strengths and weaknesses of the specification, the statistical findings and the conclusions. The essay should focus on how these factors affect the usefulness of the article in understanding the issue under consideration. Although grading will be focused on the content of the essay, clarity in argumentation is appreciated.