1. A simple linear regression was run on a set of data using an intercept and an independent
variable associated with parameters \( \beta_0 \) and \( \beta_1 \), respectively. You are given only the
following information:

(i) \( Y_i = 11.5 - 1.5X_i \).

(ii) The t-test for \( H_0 : \beta_1 = 0 \) was insignificant at the \( \alpha = 0.05 \) level. A computed \( t \) of
\( -4.087 \) was compared to \( t_{(0.025, 2)} = 4.303 \).

(iii) The estimate of \( \sigma^2 \) was \( s^2 = 1.75 \).

(a) Complete the analysis of variance (ANOVA) table using the given result. Write down
the null and alternative hypotheses corresponding to the \( F \) value and state your
conclusion.

(b) Compute and interpret the coefficient of determination \( R^2 \).

2. Consider the following results for two samples randomly taken from two populations, A and B.

<table>
<thead>
<tr>
<th>Sample</th>
<th>Sample Size</th>
<th>Sample Mean (unbiased)</th>
<th>(unbiased) Sample Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample A</td>
<td>5</td>
<td>24</td>
<td>11</td>
</tr>
<tr>
<td>Sample B</td>
<td>6</td>
<td>20</td>
<td>12.8</td>
</tr>
</tbody>
</table>

(a) Develop a 95% confidence interval for the difference between the two population means
if we have known population variances to be 10 and 12 for population A and population B,
respectively. What assumptions were made to develop the confidence interval?

(b) Test the hypothesis that there is no difference between the two population means at the \( \alpha = 0.05 \) level if both population variances are unknown. What assumptions were made to
perform the test?

3. Let \( f(x; \theta) = (\frac{1}{\theta}) x^{(\frac{1}{\theta})-1} \) for \( 0 < x < 1, 0 < \theta < \infty \).

(a) Find the maximum likelihood estimator of \( \theta \), \( \hat{\theta} \).

(b) Show that \( E(\hat{\theta}) = \theta \) and thus \( \hat{\theta} \) is an unbiased estimator of \( \theta \).

(c) Find the sufficient statistic of \( \theta \).
4. Let \( Y_1, Y_2, \ldots, Y_5 \) be a random sample of size 5 from a normal population with mean 0 and variance 1, and let \( Y = \frac{1}{5} \sum_{i=1}^{5} Y_i \). Let \( Y_6 \) be another independent observation from the same population. (20%)

(a) What is the distribution of \( W = \sum_{i=1}^{5} Y_i^2 \)? Why?

(b) What is the distribution of \( ZY_6/\sqrt{U} \), where \( U = \sum_{i=1}^{5} (Y_i - Y)^2 \)? Why?

(c) What is the distribution of \( Z(5Y^2 + Y_6^2)/U \)? Why?

<table>
<thead>
<tr>
<th>Degrees of Freedom</th>
<th>Upper 5% point</th>
<th>Upper 2.5% point</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2.920</td>
<td>4.303</td>
</tr>
<tr>
<td>3</td>
<td>2.353</td>
<td>3.182</td>
</tr>
<tr>
<td>4</td>
<td>2.132</td>
<td>2.776</td>
</tr>
<tr>
<td>5</td>
<td>2.015</td>
<td>2.571</td>
</tr>
<tr>
<td>6</td>
<td>1.943</td>
<td>2.447</td>
</tr>
<tr>
<td>7</td>
<td>1.895</td>
<td>2.365</td>
</tr>
<tr>
<td>8</td>
<td>1.860</td>
<td>2.306</td>
</tr>
<tr>
<td>9</td>
<td>1.833</td>
<td>2.262</td>
</tr>
<tr>
<td>10</td>
<td>1.812</td>
<td>2.228</td>
</tr>
<tr>
<td>( \vdots )</td>
<td>( \vdots )</td>
<td>( \vdots )</td>
</tr>
<tr>
<td>( \infty )</td>
<td>1.645</td>
<td>1.96</td>
</tr>
</tbody>
</table>
1. Consider a market with two competing firms, Coke and Pepsi, whose objective is to increase their profits. Assume that each firm has two possible strategies, high or low advertisement. Here is the payoff matrix (millions):

<table>
<thead>
<tr>
<th></th>
<th>High Ad</th>
<th>Low Ad</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Ad</td>
<td>$100 Coke Profit,  $100 Pepsi profit</td>
<td>$0 Coke Profit,  $150 Pepsi profit</td>
</tr>
<tr>
<td>High Ad</td>
<td>$150 Coke Profit,  $0 Pepsi profit</td>
<td>$80 Coke Profit,  $80 Pepsi profit</td>
</tr>
</tbody>
</table>

(a) Does there exist a dominate strategy for Pepsi? Explain.
(b) Find the Nash equilibrium.
(c) What is the equilibrium outcome if Pepsi cooperates with Coke? Is this outcome stable? Explain.

2. Sarah has $300 to allocate between opera tickets and movie tickets. The price of each opera tickets is $60, and the price of each movie ticket is $6. Her marginal rate of substitution (MRS) of opera tickets for movie tickets equal 5, regardless of what market basket she choose.

(a) How many opera and movie tickets will she purchase?
(b) If the price of each opera ticket is $30 and the price of each movie ticket is $6, how many opera and movie tickets will she purchase?

3. Given the following national-income model:

\[ Y = C + I_0 + G \]
\[ C = a + b(Y - T), \quad (a > 0, 0 < b < 1) \]
\[ G = gY, \quad (0 < g < 1) \]

where Y, C, and G are national income, consumption expenditure, and government expenditures, respectively.

(a) Give the economic meaning of parameter g.
(b) Find the equilibrium national income Y.
(c) What restriction on the parameters is needed for a solution to exist? Give its economic meaning.

4. Economic integration refers to the joining together of separate national markets. Stages of integration range from partial bilateral reductions of tariffs to the complete abolition of all restrictions on commodity and factor flows.

(a) Describe two forms of economic integration, free trade area and customs union.
(b) Explain trade creation and trade diversion.
Multiple Choice Questions (30%)

Please select ONE most appropriate answer in the following questions.

( ) 1. A manager successfully makes good use of the company's resources and develops a high quality new product. However, it seems that not enough customers want to buy the product for the company to receive a reasonable profit. The manager may be said to have:
   A) high efficiency/low effectiveness.
   B) low efficiency/low effectiveness.
   C) low efficiency/high effectiveness.
   D) high efficiency/high effectiveness.
   E) none of the above.

( ) 2. Which of the following statements is TRUE?
   A) Effective managers do not need to have a high internal locus of control.
   B) Managers and workers play equally important roles in the formation of organizational culture.
   C) The collection of feelings and beliefs that workers and managers have about their current jobs is known as job satisfaction.
   D) Having a strong culture is always good for an organization.
   E) According to Fayol's principles, workers should be given fewer job duties to perform and should be encouraged to assume less responsibility for their work outcomes.

( ) 3. Which of the following statements is FALSE?
   A) Under the utilitarian rule, an ethical decision is that which creates the greatest good from the greatest number of people.
   B) The process by which division of labor occurs is known as job specialization.
   C) In a bureaucracy, the authority of a manager should be based on the personality and social status of that manager.
   D) Employees are stakeholders of a company.
   E) The line of authority that depicts the authority of managers at the top over employees at the bottom of the organization is called the "chain of command."

( ) 4. A supplier's bargaining position is especially strong when:
   A) many sources of the supply exist.
   B) the supply is vital to the organization.
   C) other materials can be substituted for their specific supply.
   D) the supply is free.
   E) the supply is not protected by patent.
5. An organization attempts to gain a competitive advantage by aiming its efforts at driving down its production costs per unit below those of its competitors. This is known as which type of strategy?
   A) Focused differentiation strategy.
   B) Low-cost strategy.
   C) Related diversification strategy.
   D) Unrelated diversification strategy.
   E) Concentration on a single business strategy.

6. Which of the following theories suggests that distinctions between needs related to work itself from those related to the context of the work:
   A) Maslow's Hierarchy Theory.
   B) Alderfer's ERG Theory.
   C) Herzberg's Motivator-Hygiene Theory.
   D) McClelland's Needs Theory.
   E) Expectancy Theory.

7. The benchmarking process begins with the:
   A) determination of what functions to benchmark.
   B) identification of the key performance variables to measure.
   C) identification of the best-in-class.
   D) selection of the companies to benchmark.
   E) identification of all companies in the industry.

8. One way organizations can keep their hierarchy flat is to:
   A) decrease the span of control.
   B) increase the number of levels of management.
   C) decentralize authority.
   D) enlarge jobs.
   E) decrease autonomy.

9. In MBO, what is the relationship between subordinates' specific performance goals and organizational goals?
   A) Subordinates' goals are set first; then aggregated to form unit and organizational goals.
   B) Organizational goals are set first; subordinates' goals are aimed towards these targets.
   C) Subordinates' and organizational goals are set independently.
   D) Subordinates' and organizational goals are not related to each other.
   E) Subordinates' and organizational goals may be contradictory.
( ) 10. One of the drawbacks inherent in a multibrand strategy is:
   A) the potential of not being able to convince consumers the additional branded component really makes a difference.
   B) dilution of the brand’s meanings.
   C) the inability to use a repositioning strategy.
   D) the ability for one manufacturer to occupy more shelf space.
   E) small market share.

Part II: Essay Questions

1. A SWOT analysis can be an effective way of analyzing both the internal situation of a business and the external environment in which the organization carries out its business.
   (1) Discuss what is meant by a SWOT analysis. (5%)
   (2) Discuss specific examples of each part of SWOT analysis as it would apply to a biotechnology company. (15%)

2. What is socialization? How does it occur? Why is it important for organizations? (15%)

3. Explain Equity Theory. What does Equity Theory suggest people do when they feel they are not being treated fairly? (15%)

4. You are the vice president of the human resource department for a major manufacturer company. Your company is going to implement a project for transferring part of the production lines from Taiwan to mainland China. The project will require laying off 100 employees of production department in Taiwan. However, you need the help of all the employees in the production department to transfer the production lines and adapt the department’s processes. What incentives are needed to induce employees to undertake these tasks? (20%)