1. You ask your neighbor to water a sickly plant while you are on vacation. Without water it will die with probability 0.8; with water it will die with probability 0.15. You are 90 percent certain that your neighbor will remember to water the plant.
   (a) What is the probability that the plant will be alive when you return? (10%)
   (b) If it is dead, what is the probability your neighbor forgot to water it? (10%)

2. Many public polling agencies conduct surveys to determine the current consumer sentiment concerning the state of the economy. For example, the Bureau of Economic and Business Research (BEBR) at the University of Florida conducts quarterly surveys to gauge consumer sentiment in the Sunshine State. Suppose that BEBR randomly samples 484 consumers and finds that 257 are optimistic about the state of the economy. (Use $Z_{0.05} = 1.645$, or $Z_{0.1} = 1.28$)
   (a) Use a 90% confidence interval to estimate the proportion of all consumers in Florida who are optimistic about the state of the economy? (10%)
   (b) Based on the confidence interval, can BEBR infer that the majority of Florida consumers are optimistic about the economy? (10%)

3. A state employee wishes to see there is a significant difference in the number of employees at the interchanges of three state toll roads. The data are shown in Table 1.
   (a) Please state the hypotheses when $\mu_1$, $\mu_2$, and $\mu_3$ denote means of employees at the interchanges of Pennsylvania Turnpike, Greenburg Bypass Mon-Fayette Expressway and Beaver Valley Expressway, respectively. (10%)
   (b) Please construct the ANOVA table. (10%)
   (c) At $\alpha = 0.05$, can it be concluded that there is a significant difference in average number of employees at each interchange? (10%)

   (F_{0.05}(2,15) = 3.68, F_{0.05}(15,2) = 19.43, F_{0.05}(18,3) = 8.68, F_{0.05}(3,18) = 3.16)

<table>
<thead>
<tr>
<th>Table 1: The number of employees at the interchanges of three state toll roads</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pennsylvania Turnpike</td>
</tr>
<tr>
<td>-----------------------</td>
</tr>
<tr>
<td>7</td>
</tr>
<tr>
<td>14</td>
</tr>
<tr>
<td>32</td>
</tr>
<tr>
<td>19</td>
</tr>
<tr>
<td>10</td>
</tr>
<tr>
<td>11</td>
</tr>
</tbody>
</table>
4. Many variables influence the sales of existing single-family homes. One of these is the interest rate charged for mortgage loans. A SAS printout of the simple linear regression is provided in Table 2.

(a) Do the data provide sufficient evidence to indicate that the mortgage interest rate contribute information for the prediction of annual sales of existing single-family homes? (Use $\alpha = 0.05$) (10%)

(b) Compute R-Squared and interpret its value. (10%)

(c) A 95% confidence interval for the mean annual number of existing single-family homes sold is [3714.7, 4052] when the average annual mortgage interest rate is 8.0%, and a 95% prediction interval for the annual number of existing single-family homes sold is [3364.1, 4402.7] when the average annual mortgage interest rate is 8.0%. Explain why the widths of intervals found in confidence interval and prediction interval differ. (10%)
1. Please compute the limit in detail as follows: 
\[ \lim_{x \to \infty} \left( 1 + \frac{1}{x} \right)^x. \] (10%)

2. Find the derivative of the function \( y = \left( \frac{1}{x} \right)^x. \) (10%)

3. Find \( \frac{dy}{dx} \) by implicit differentiation of \( y^2 + x^2 y = 3x^2. \) (10%)

4. Find the indefinite integral and definite integral 
   (a) \( \int_0^1 \frac{e^x}{\sqrt{1+e^x}} \, dx \) 
   (b) \( \int x^2 \ln x \, dx. \) (10%)

5. Evaluating the integral using polar coordinates for \( \int_0^\infty e^{-x^2} \, dx. \) (10%)

6. Find the \( \frac{dw}{dt} \) using the appropriate Chain Rule for the following function, 
   \( w = e^{xy}, \) where \( x = t^2 \) and \( y = t^3. \) (10%)

7. Find the maximum production level \( P \) if the total cost of labor (at $48 per unit) and capital (at $36 per unit) is limited to $100,000, where \( x \) is the number of units of labor and \( y \) is the number of units of capital. The profit function of the production level \( P \) is 
   \[ P(x, y) = 100x^0.4y^{0.6}. \] (10%)

8. A company introduces a new product for which the number of units sold \( S \) is 
   \[ S(t) = 200 \left( 5 - \frac{9}{2 + t} \right) \] where \( t \) is the time in months.
   (a) Please describe Mean Value Theory. (10%)
   (b) Find the average value of \( S(t) \) during the first year by Mean Value Theory. (10%)
   (c) During what month does \( S'(t) \) equal the average value during the first year? (10%)
1. Suppose the government imposes a gasoline tax and assume that the tax would raise the price of gasoline from \( p \) to \( p' = p + t \). Now if the government rebates the tax revenue in the form of direct money payment, then (10 points)

(a) What would happen to the consumers' well-being and the consumption amount of gasoline?

(b) If the rebate to the consumers were based on their original consumption of gasoline, rather than on their final consumption of gasoline, would the government be paying out more or less than it received in tax revenues?

2. Let the utility function of a consumer be given by \( u(x, y, z) = x^a y^b z^c \), \( a, b, c > 0 \). Use the notations: \( P_x, P_y, P_z \) for prices and \( m \) for consumer’s income. (10 points)

(a) Find the demand function for this consumer.

(b) Show that the above utility has homothetic preference.

3. Suppose an economic agent has initial wealth \( w \) and is considering investing some amount \( x \) in a risky asset, which has a rate of return \( r_g > 0 \) in good state and \( r_b < 0 \) in bad state of outcomes, respectively. Assume further that the good state has probability \( \pi \) and the bad state has probability \( (1 - \pi) \). Using expected utility hypothesis to analyze how much \( x \) would the agent decide to invest in the risky asset. How does the level of investment in this risky asset change when the government taxes its return? (10 points)

4. Analyze the factor demand behavior for a firm which has monopolistic power in product market and is a monopsony in factor market. Is the equilibrium Pareto efficient? (10 points)
5. Describe the forms of strategic interactions in a market of two firms (duopoly) which produce a homogenous product. In particular, in a Stackelberg model (quantity leadership), suppose the demand function is \( p(y_1 + y_2) = a - b(y_1 + y_2) \), where \( y_1 \) is the leader's output, \( y_2 \) is the follower's output. Also assume that both firms have zero production costs. Then what are the equilibrium market output and price? (10 points)

6. Explain three tools of monetary policy of the central bank and how each is used to change the money supply. Does each tool affect the monetary base or the money multiplier? (10 points)

7. Show graphically by using ISLM model and explain why targeting an interest rate is preferable when money demand is unstable and the IS curve is stable. (10 points)

8. Demonstrate graphically and explain the short-run and long-run effects of an unanticipated monetary expansion in the new classical model. (10 points)

9. Define and list an example for adverse selection and moral hazard respectively. What is the primary factor cause adverse selection and moral hazard, and why these problems are important for the financial system? (10 points)

10. Define frictional unemployment and structural unemployment respectively? Why frictional unemployment accounts for a larger share of total unemployment when the unemployment rate is low? (10 points)
I. Multiple Choice Questions (2 points each, total 40 points)

Note: Use the following format to write your answers of this section in your answer sheet:

123456789 1 0
11 12 13 14 15 16 17 18 19 20

1. The standard deviation of a portfolio that has 30% of its value invested in a risk-free asset and 70% of its value invested in a risky asset with a standard deviation of 20% is ____%.
   A. 18
   B. 14
   C. 21
   D. 6
   E. 21

2. Other things equal, diversification is most effective when
   A. securities' returns are uncorrelated.
   B. securities' returns are positively correlated.
   C. securities' returns are high.
   D. securities' returns are negatively correlated.
   E. none of the above.

3. In an efficient market the correlation coefficient between stock returns for two non-overlapping time periods should be
   A. positive and large.
   B. positive and small.
   C. zero.
   D. negative and small.
   E. negative and large.

4. The main difference between the three forms of market efficiency is that
   A. the definition of efficiency differs.
   B. the definition of excess return differs.
   C. the definition of prices differs.
   D. the definition of information differs.
   E. they were discovered by different people.
5. You purchased an annual interest coupon bond one year ago that had 6 years remaining to
maturity at that time. The coupon interest rate was 10% and the par value was $1,000. At the
time you purchased the bond, the yield to maturity was 8%. If you sold the bond after receiving
the first interest payment and the yield to maturity continued to be 8%, your annual total rate of
return on holding the bond for that year would have been __________.
A. 8.24%
B. 7.82%
C. 8.00%
D. 10%
E. none of the above

6. Other things being equal, a low ________ would be most consistent with a relatively high growth
rate of firm earnings and dividends.
A. dividend payout ratio
B. degree of financial leverage
C. variability of earnings
D. inflation rate
E. both A and B

7. The present value of growth opportunities (PVGO) is equal to
A. the difference between a stock’s price and its no-growth value per share.
B. zero if its return on equity equals the discount rate.
C. the net present value of favorable investment opportunities.
D. all of the above
E. none of the above

8. The free cash flow hypothesis states:
A. that firm with greater free cash flow will pay more in dividends reducing the risk of financial
distress.
B. that firm with greater free cash flow should issue new equity to force managers to minimize
wasting resources and to work harder.
C. that issuing debt requires interest and principal payments reducing the potential of management
to waste resources.
D. All of the above
E. none of the above
9. The Effect of financial leverage on the performance of the firm depends on:
A. the rate of return on equity
B. the firm's level of EBIT
C. the rate of dividend growth
D. both A and B
E. both B and C

10. MM Proposition I (no taxes) is used to illustrate:
A. that one capital structure is as good as another.
B. Leverage does not affect the value of the firm.
C. Capital structure changes do not affect stockholder's welfare.
D. All of the above
E. Both A and B

11. Put-Call Parity can be used to show:
   A) that the value of a call option is always twice that of a put given equal exercise prices and equal expiration dates.
   B) that the value of a call option is always half that of a put given equal exercise prices and equal expiration dates.
   C) how far in-the-money call options can get.
   D) the precise relationship between put and call prices given equal exercise prices and equal expiration dates.
   E) how far in-the-money put options can get.
12. **NUK Corporation's Balance Sheet and Income Statement as shown below:**

**BALANCE SHEET**
(in thousands of dollars)

<table>
<thead>
<tr>
<th>ASSETS</th>
<th>2001</th>
<th>2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Assets</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cash</td>
<td>21,113</td>
<td>19,930</td>
</tr>
<tr>
<td>Receivables</td>
<td>7,336</td>
<td>3,275</td>
</tr>
<tr>
<td>Inventories</td>
<td>25,135</td>
<td>24,270</td>
</tr>
<tr>
<td>Total</td>
<td>53,584</td>
<td>47,475</td>
</tr>
<tr>
<td>Fixed Assets</td>
<td>25,767</td>
<td>19,720</td>
</tr>
<tr>
<td>Total Assets</td>
<td>79,351</td>
<td>67,195</td>
</tr>
<tr>
<td>LIABILITIES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current Liabilities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accounts Payable</td>
<td>9,493</td>
<td>7,273</td>
</tr>
<tr>
<td>Notes Payable</td>
<td>429</td>
<td>416</td>
</tr>
<tr>
<td>Other</td>
<td>3,990</td>
<td>3,180</td>
</tr>
<tr>
<td>Total</td>
<td>13,912</td>
<td>10,869</td>
</tr>
<tr>
<td>Long-term Liabilities</td>
<td>7,796</td>
<td>6,088</td>
</tr>
<tr>
<td>Stockholder's Equity</td>
<td>57,643</td>
<td>50,238</td>
</tr>
<tr>
<td>Total Liability and Equity</td>
<td>79,351</td>
<td>67,195</td>
</tr>
<tr>
<td>NET INCOME</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(in thousands of dollars)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Net Sales</td>
<td>113,260</td>
<td>96,695</td>
</tr>
<tr>
<td>Cost of Goods Sold</td>
<td>75,586</td>
<td>65,039</td>
</tr>
<tr>
<td>Other Operating Expenses</td>
<td>25,832</td>
<td>26,208</td>
</tr>
<tr>
<td>Operating Profit</td>
<td>6,676</td>
<td>5,448</td>
</tr>
<tr>
<td>Other Income</td>
<td>7,061</td>
<td>6,280</td>
</tr>
<tr>
<td>Interest</td>
<td>658</td>
<td>520</td>
</tr>
<tr>
<td>Tax</td>
<td>3,924</td>
<td>3,362</td>
</tr>
<tr>
<td>Net Profit</td>
<td>9,155</td>
<td>7,846</td>
</tr>
<tr>
<td>Dividends</td>
<td>460</td>
<td>441</td>
</tr>
<tr>
<td>Retained Earnings</td>
<td>8,695</td>
<td>7,405</td>
</tr>
</tbody>
</table>

*(all sales and purchases are credit)*

The cash cycle for 2001 is:

A) 98.74 days.
B) 140.27 days.
C) 50.71 days.
D) 95.93 days.
E) 81.65 days.
13. Company NUK expects a total need of $12,500 over the next 3 months. They have a beginning 
cash balance of $1,500, and cash is replenished when it hits zero. The fixed cost of selling 
securities to replenish cash balances is $3.50. The interest rate on marketable securities is 8% 
per annum. There is a constant rate of cash disbursement and no cash receipts during the month. 
What is the total opportunity cost for a month based on the firm’s current practice?
A) $27.92.
B) $18.98.
C) $5.00.
D) $60.00.
E) None of the above.

14. If both dividends and capital gains are currently taxed at the same ordinary income tax rate, the 
effect of the tax is different because:
A) capital gains are actually taxed, while dividends are taxed on paper only.
B) dividends are actually taxed, while capital gains are taxed on paper only.
C) dividends are taxable when distributed while capital gains are deferred until the stock is 
sold.
D) capital gains are taxable when distributed while dividends are deferred until the stock is 
sold.
E) both a and c.

15. The ABC Corporation with a book value of $20 million and a market value of $30 million has 
merged with the XYZ Corporation with a book value of $6 million and a market value of $8 
 million at a price of $9 million. If the transaction is a purchase then the total assets on the books 
of the new company will be:
A) $29 million.
B) $26 million.
C) $38 million.
D) $39 million.
E) None of the above.
16. A futures contract on corns states that buyers and sellers agree to make or take delivery of a bushel of corn for $20 per bushel. The contract expires in 6 months. The current price of corns is $21 per bushel. If the price of corns falls and continues to fall every day over the 6 month period, then when the contract is settled, the buyer will _____ and the seller will _____.
   A) gain; lose
   B) gain; gain
   C) lose; lose
   D) gain; break even
   E) lose; gain

17. Firms that use financial leases must consider their debt-to-equity ratios as inadequate measures of financial leverage because:
   A) lenders are concerned about the firm's total liabilities and related cashflow.
   B) debt displacement occurs with leasing.
   C) less future debt can be raised for a growing firm when a lease is used.
   D) All of the above.
   E) None of the above.

18. "The difference between the spot and forward exchange rates between two countries depends on the relative interest rates in the two countries." This is a statement of:
   A) Unbiased Forward Rates.
   B) International Fisher Effect (IFE).
   C) Absolute Purchasing Power Parity (Absolute PPP).
   D) Relative Purchasing Power Parity (Relative PPP).
   E) Interest Rate Parity (IRP).

19. The Omega Asset Management Corporation (AMC) has an investment in accounts receivable of $2,750,000. Daily credit sales are $118,280. If 30% of Omega's credit customers receive a discount by paying within 10 days, what is the net period that Omega maintains?
   A) 23 days.
   B) 38 days.
   C) 45 days.
   D) There is not enough information to tell.
   E) 10 days.
20. The most recent financial statements for TSMC are shown below.

<table>
<thead>
<tr>
<th>Income Statement</th>
<th>Balance Sheet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales: 400</td>
<td>Assets: 1200</td>
</tr>
<tr>
<td>Costs: 200</td>
<td>Debt: 600</td>
</tr>
<tr>
<td>Taxes: 50</td>
<td>Equity: 600</td>
</tr>
<tr>
<td>Net income: 150</td>
<td>Total: 1200</td>
</tr>
</tbody>
</table>

Assets and costs are proportional to sales. Debt is not. A dividend of $90 was paid, and TSMC wishes to maintain a constant payout to net income. Next year's sales are projected to be $480. What is external funds needed (EFN)?

A) $60.00.
B) $240.00.
C) $168.00.
D) $132.00.
E) None of the above.

II. Problem Solving and Short Essay Questions (total 60 points)

1. NUK High Tech Company is expected to have EPS in the coming year of $5. The expected ROE is 14%. An appropriate required return on the stock is 11%. If the firm has a dividend payout ratio of 40%, the intrinsic value of the stock should be ______? (10 points)

2. The IRR rule is said to be a special case of the NPV rule. Explain why this is so and why it has some limitations NPV does not? (10 points)

3. Explain the static trade-off theory of capital structure. (integration of tax effects and financial distress costs) (10 points)
A private equity consortium led by The Carlyle Group is planning to make a $5.5 billion bid for the world’s biggest microchip packaging firm, Advanced Semiconductor Engineering, the companies said on Friday.

At $1.19 a share, the potential Carlyle bid represents a 10 percent premium to Taiwan-based ASE’s Friday closing price of $1.08 a share, and values the firm at about $5.46 billion, according to Reuters data.

The American depositary shares of ASE, which encases silicon chips in plastic packages so they can be connected to circuit boards, rose nearly 15.2 percent to $6.06 in New York trading on Friday.

The move is the latest sign of private equity interest in the chip industry, after Freescale Semiconductor agreed in September to a $17.6 billion leveraged buyout to a group that also included Carlyle.

Private equity firms, which look for steady cash flow and long-term growth prospects, are investing in the maturing semiconductor industry as it goes through a phase of slower but steadier growth.

“As a Carlyle affiliated entity, ASE would be in a position to better take advantage of accelerating global outsourcing trends for semiconductor assembly and testing services,” Carlyle said in a statement.

The private equity firm said ASE would benefit from being under the same ownership as Carlyle’s other microchip properties, which include Toshiba Ceramics, Jazz Semiconductor and AZ Electronics.

ASE said its chief executive, Jason Chang, has agreed to roll his stake in the company into a bid by the consortium, subject to some conditions. Chang and his affiliated holding company, ASE Enterprises Ltd., hold about 18.4 percent of ASE.

The company said it had not yet approved a bid.

“Discussions between ASE and the consortium have not been completed, and there can be no assurance that an offer will ultimately be made by the consortium or what the ultimate terms of such an offer would be,” ASE said in a statement.

ASE counts ATI Technologies, Qualcomm and Freescale among its major clients. It competes with smaller Taiwan rival Siliconware Precision Industries, U.S.-based Amkor Technology and Singapore’s STATS ChipPAC.

Last month ASE said its third-quarter profit more than doubled on recovering chip demand, but it forecast weaker sales and falling profit margins in the fourth quarter.
ASE's 2006 net profit is forecast to increase by a quarter to $558 billion, according to Reuters Estimates.

Its forecast earnings per share is 12 cents, making the bid about 10 times forecast earnings, similar to Siliconware.

Carlyle also said its planned bid illustrates the firm's confidence in Taiwan, where it has been an active investor since 1999. Its other investments there include Taiwan Broadband Communications and Eastern Multimedia Corp.

Earlier this week, U.S. electronics component maker Jabil Circuit said it planned to buy Taiwan's Green Point Enterprises for around $881 million.

4. The news above is from Reuters published on ZDNet News: November 25, 2006, 9:07 AM PT.
   Answer the following questions.
   A. Briefly describe the meaning of the news in 300 words. (5 points)
   B. Define leveraged buyout (LBO) and private equity fund respectively. (5 points)
   C. List two reasons that LBO might create firm's value if the deal goes well. (5 points)

5. Suppose you own 5,000 shares of common stock in a firm with 2.5 million total shares outstanding. The firm announces a plan to raise an additional 45 million dollars through a rights offering. The market value of the stock is $50 before the rights offering and the new shares are being offered to existing shareholders at a 10% discount of the market value.
   A. What is preemptive right? How many rights are required to acquire a new issuing share? If you exercise your rights, how many of the new shares can you purchase? (6 points)
   B. What is the market value of the stock after going ex-rights if the total value of all stocks increases by the amount of the new funds? (3 points)
   C. What is your total investment in the firm after the rights offering? How is your investment split between original shares and new shares? (3 points)
   D. If you decide not to exercise your rights and your rights are salable, what is the value per preemptive right? What is your investment in the firm and cash position after the rights offering? Does your total wealth of the investment on this firm change after the ex-right date? (3 points)