#20:	#21:	Total:

VERSION 1

MIME 310 ENGINEERING ECONOMY

Class Test #1 – Thursday, 12 October, 2006 – 90 minutes

PRINT your family name / initial and record your student ID number in the spaces provided below.

FAMILY NAME / INITIAL	S	O	L	U	T	I	O	N	S											

STUDENT ID #									

This test consists of 19 multiple-choice questions, and two problems requiring a full solution. Each correct multiple-choice question is worth 4 points. There are no penalties for incorrect answers. The problems are worth a total of 24 points.

MULTIPLE-CHOICE QUESTIONS
Circle the correct answer on this test paper and record it on the computer answer sheet.

1. Assuming there will be no shift in the supply or demand curves, what will bring the market into equilibrium if the supply for a product is too high relative to its demand? The price will:
   A) rise, supply will fall, and demand will rise.
   B) rise, supply will rise, and demand will fall.
   C) fall, supply will fall, and demand will rise.
   D) fall, supply will rise, and demand will fall.

2. If you are willing to pay $30 for a shirt but you only have to pay $26. The $4 difference is:
   A) your consumer surplus
   B) the producer's deficit
   C) your consumer deficit
   D) the producer's surplus

3. If the number of widgets demanded increases from 19 to 21 when the price increases from $1.00 to $1.50, the arc elasticity of demand is:
   A) –0.25
   B) unitary elastic
   C) 0.5
   D) 0.1
   E) none of the choices given above

This situation is impossible because when the price increases, demand must fall.

4. The law of diminishing marginal returns states that for a given production process, as more and more resources (e.g., labour) are added, output:
   A) decreases at an increasing rate.
   B) decreases at a decreasing rate.
   C) increases at an increasing rate.
   D) increases at a decreasing rate.

5. When the marginal cost equals the average cost, the production of an additional unit will cause the:
   A) average cost to increase.
   B) average cost to remain unchanged.
   C) average cost to decrease.
   D) marginal cost to increase.
   E) Both situations in A and D

As the marginal cost function intersects the average cost function at its minimum, well beyond its own minimum, both functions have positive slopes.

Use the following information to answer questions 6 to 8.

An asset costs $50 000 and has an estimated salvage value of $10 000 at the end of its useful life of 5 years.

6. Using the straight-line method, the depreciation charge for tax purposes in the third year of ownership of the asset is:
   A) $10 000
   B) $8000
   C) $20 000
   D) none of the choices given above
   E) Cannot determine depreciation without annual depreciation rate

The salvage value is ignored when depreciating for tax purposes.

DC = 50 000 / 5 = 10 000

7. Using the declining-balance method with an annual depreciation rate of 20%, the book value for accounting purposes after five years of ownership is:
   A) $4096
   B) $20 480
   C) $16 384
   D) $10 000
   E) none of the choices given above

At the end of five years, the book value equals the salvage value.

8. Using the sum-of-the-years'-digit method, the depreciation charge for accounting purposes in the second year of ownership of the asset is:
   A) $5333
   B) $26 000
   C) $10 667
   D) none of the choices given above
   E) Cannot determine depreciation without annual production rates over life

Sum of the years' digits: 1 + 2 + 3 + 4 + 5 = 15

DC = (50 000 - 10 000) (4 / 15) = 10 667

Use the financial statements below to answer questions 9 to 11.

Marble Comics Group
Year-end Balance Sheets
($ millions)

	1998	1999		1998	1999
Cash	75	135	Accounts payable	89	110
Accounts receivable	230	214	Notes payable	227	442
Inventory	240	188	Current liabilities	316	552
Current assets	545	537	Long-term debt	615	440
Net fixed assets	788	890	Common stock	55	55
			Retained earnings	347	380
Total Assets	1333	1427	Total Liab. & S. Equity	1333	1427

Income Statement for 1999
($ millions)

Net sales	905
Less: Cost of goods sold	522
Less: General & admin. expenses	93
Less: Depreciation	110
EBIT	180
Less: Interest on long-term debt	61
Earnings before taxes	119
Less: Taxes	30
Net income	89

9. Marble Comics' debt to equity ratio at the end of 1999 is:
   A) 0.31
   B) 0.70
   C) 0.39
   D) 1.01
   E) None of the choices given above

D/E: Long-Term Debt / Shareholders' Equity
440 / (55 + 380) = 1.01

10. Marble Comics' inventory turnover ratio for 1999 is:
   A) 2.78
   B) 2.44
   C) 4.81
   D) 4.23
   E) None of the choices given above

ITR: Cost of Goods Sold / Average Inventory
522 / [(240 + 188) / 2] = 2.45

11. Using 365 days per year, Marble Comics' average collection period (days) for 1999 is:
   A) 155
   B) 40
   C) 90
   D) 86
   E) None of the choices given above

ACP: Average Accounts Receivable / Average Daily Sales
[(230 + 214) / 2] / (905 / 365) = 89.5

12. Suppose that a project to be undertaken requires an increase in inventory of $10 000, a decrease in Accounts Payable of $6000 and an increase in Prepaid Assets of $3000 as soon as it starts. The firm uses a discount rate of 10 percent. What is the impact of these changes on the operating cash flow?

A) It will decrease by $19 000.
B) It will increase by $7000.
C) It will decrease by $7000.
D) It will increase by $1000.
E) It will decrease by $4275.

+10 000 in inventory:	-10 000 in OCF
-6000 in accounts payable:	- 6 000 in OCF
+3000 in prepaid assets:	- 3 000 in OCF
Total decrease in OCF:	-19 000

13. All else remaining the same, the impact of interest rate change on the market price of bonds is highest for bonds with:

I. low coupon rates.
II. variable rate coupons.
III. long maturities.

A) I only
B) I and II only
C) I and III only
D) II and III only
E) I, II, and III

The longer the maturity period and the lower the coupon rate, the more the market price of a bond is vulnerable to changes in the market interest rate.

14. Over the past four years, a company has paid dividends of $1.00, $1.10, $1.20, and $1.30, respectively. This pattern is expected to continue into the future. This is an example of a company paying a:

A) dividend that grows at an annual rate of 10 %.
B) dividend that grows at a constant annual rate.
C) dividend that grows by a decreasing amount.
D) dividend that grows at a decreasing annual rate.
E) preferred stock dividend.

15. What is the present value of an income stream which has a negative end-of-year monetary flow of $100 per year for each of the next 3 years, and a positive end-of-year monetary flow of $300 per year in years 4 through 7, if the appropriate discount rate is 10%?

A) $466
B) $512
C) $898
D) $963
E) $1200

PV of monetary flows:

-100 (P/A,10%,3) + 300 (P/A,10%,4) (P/F,10%,3)
-100 (2 4869) + 300 (3.1699) (0.7513) = 465.77

16. Four years from now you will receive the first of seven annual payments of $10 000. The current annual interest rate is 6%, but by the beginning of year 4, the interest rate will rise to 8%. What is the present value today of this stream of payments?

A) $41 827
B) $42 554
C) $43 714
D) $46 864
E) $55 692

PV of annual payments at t=3: 10 000 (P/A,8%,7) = 52 064
(note that t=3 is the beginning of year 4)
PV at t=0: 52 064 (P/F,6%,3) = 43 714

17. HiTek's common shares are currently priced at $45 each. If an investor who purchased the stock 12 months ago receives an 83 cent dividend and sells the stock today, she will realise a return on her investment of 38.88 %. At what price did she buy the stock?

A) $30.00
B) $31.00
C) $33.00
D) $45.00
E) $60.00

Amount received on day of sale: 45 + 0.83 = 45.83

Equivalent value one year ago: 45.83 / (1 + 0.3888) = 33

18. Healthy Smokes, Inc. manufactures nicotine free cigarettes. As their target customers age and pass on, sales of the product are expected to decline. Thus, demographics suggest that earnings and dividends will decrease at an annual rate of 8% forever. The firm recently paid a dividend of $4.00. Given a required return on investment of 12%, the stock should sell for (*Hint: determine the present value today of the infinite stream of future dividends*)

A) $94.98
B) $72.00
C) $48.22
D) $35.00
E) $18.40

PV of future stream of dividends with g= -0.08:

4.00 [(1 + (-0.08)] / [(0.12 – (-0.08)] = 18.40

19. You have some money to invest. You have one of 2 choices: Savings Account A that earns 8 % compounded annually or Savings Account B that earns 7.5 % compounded quarterly. Which of the following statement(s) qualify your best alternative?

I. Account A because it has a higher effective annual rate.
II. Account A because the future value of your investment in one year will be higher.
III. Account B because it has a higher effective annual rate.
IV. Account B because the future value of your investment in one year will be lower.

A) I only
B) II only
C) III only
D) I and II only
E) III and IV only

A's effective rate: 8 %
B's effective rate: $(1 + 0.075/4)^4 - 1 = 7.71$ %

FULL-SOLUTION PROBLEMS
For full marks, show the complete solutions on the lines provided and record the answers in the boxes.

20. You are evaluating a project to add a new product to your company's line. The sales price per unit is expected to be $400. In year one, sales are projected at 1000 units while in year two, the company expects to sell 1500 units. Variable costs amount to $225 per unit and fixed costs are $125 000 per year. The project requires an initial investment of $105 000, which will be depreciated by the straight-line method to zero over the three-year life of the project. The company's uses a 10 % discount rate and the income tax rate is 34 %. What is the net income of the project in year 2? (10 points)

VERSION 1
Revenue from sales: 1500 (400) = 600 000
Operating expenses: 125 000 + 1500 (225) = 462 500
Depreciation: 105 000 / 3 = 35 000
Taxable income: 600 000 – 462 500 – 35 000 = 102 500
Income tax: 102 500 (0.34) = 34 850

Net income: 102 500 – 34 850 = 67 650

VERSION 2
Revenue from sales: 1500 (500) = 750 000
Operating expenses: 125 000 + 1500 (300) = 575 000
Depreciation: 105 000 / 3 = 35 000
Taxable income: 750 000 – 575 000 – 35 000 = 140 000
Income tax: 140 000 (0.34) = 47 600

Net income: 140 000 – 47 600 = 92 400

ANSWER $67 650

21. You are saving for the college education of your two children. One child will enter college in 5 years' time, while the other will enter college in 7 years' time. College costs are expected to be $10 000 per year, payable at the beginning of the school year. You assume that each child will be in college for four years. Your plan is to contribute a fixed amount to a fund over each of the next 5 years, with your first contribution at the end of this year, and your final contribution on the date at which your first child enters college. The interest rate is 8 percent per year. How much should you contribute each year in order to meet the expected cost of your children's education? (14 points)

VERSION 1

Amount required for one child on day of first tuition payment:

Using annuity due – 10 000 + 10 000 (P/A,8%,3) = 10 000 + 25 771 = 35 771

Amount required for both children on day of first tuition payment for first child entering college:

35 771 + 35 771 (P/F,8%,2) = 35 771 + 30 668 = 66 439

Annual contribution (using ordinary annuity): 66 439 (A/F,8%,5) = 11 325

VERSION 2

Amount required for one child on day of first tuition payment:

Using annuity due – 12 000 + 12 000 (P/A,8%,3) = 12 000 + 30 925 = 42 925

Amount required for both children on day of first tuition payment for first child entering college:

42 925 + 42 925 (P/F,8%,2) = 42 925 + 36 801 = 79 726

Annual contribution (using ordinary annuity): 79 726 (A/F,8%,5) = 13 590

ANSWER $11 325

This is the last page of the test paper.

Answer Key for Version 2

1. A
2. D
3. E
4. B
5. E
6. B
7. B
8. B
9. C
10. A
11. D
12. E
13. E
14. B
15. E
16. B
17. A
18. A
19. E