KATHMANDU UNIVERSITY
End Semester Examination
February/March, 2018

Marks scored:

Level : B. E./ B. Sc./B. Pharm./B. Tech.
Year : III

Course : MGTS 301
Semester : I

Exam Roll No. :

Time: 30 mins.

F. M. : 20

Registration No.:

Date MAR 0 9 2018

SECTION "A"
[20 Q. × 1=20 marks]

1. Economics is the study of
   a. how society manages its unlimited resources.
   b. how society manages its scarce resources.
   c. how to fully satisfy our unlimited wants.
   d. how to reduce our wants until we are satisfied.

2. Which of the following market situation exist for most of the general economic principles?
   a. Monopolistic
   b. Monopoly
   c. Oligopoly
   d. Perfect competition

3. A toy manufacturing company has a capacity of 300,000 units annually. The fixed cost of the production line is $200,000 per year with a variable cost of $4 per unit and revenues of $7 per unit. The percent of capacity that must be utilized for the company to breakdown is closest to:
   a. 22
   b. 31
   c. 39
   d. 46

4. A sunk cost is the difference between:
   a. The initial investment and the market value
   b. The book value and the market value
   c. The market value and the salvage value
   d. The initial investment and the salvage value

5. Opportunity costs arise in production because
   a. Resources must be shifted away from producing one good in order to produce another
   b. Monetary costs of inputs usually outweigh non-monetary costs
   c. Wants are limited in society
   d. Resources are unlimited

6. At 8 percent compounded annually, how long will it take $750 to double?
   a. 12 years
   b. 9 years
   c. 48 years
   d. 6.5 years

7. A 49 year-old person wants to accumulate $500,000 by age 65. How much will she need to save each month, starting one month from now, if the interest rate is 0.5% per month?
   a. $618
   b. $900
   c. $500
   d. $720

8. A manufacturing company spent $30,000 on a new conveyor belt. If the conveyor belt resulted in cost savings of $4,200 per year, the length of time it would take for the company to recover its investment at 8% per year is closet to:
   a. Less than 9 years
   b. 9 to 10 years
   c. 11 to 12 years
   d. Over 12 years

9. What is the capitalized worth, when interest rate is 10% per year, of $1,500 per year, starting in year one and continuing forever?
   a. $ 150
   b. $1,500
   c. $15,000
   d. $150,000

10. The first cost of a dam that is expected to have an infinite life is $30 million. The maintenance cost of the dam will be $200,000 per year. At an interest rate of 10% per year, the annual worth of the dam is nearest to:
   a. $3,000,000
   b. $200,000
   c. $4,500,000
   d. $3,200,000

11. A small company plans to spend $10,000 in year 2 and $10,000 in year 5. At an interest rate of effective 10% per year, compounded semiannually, the equation that represents the equivalent annual worth A in years 1 through 5 is:
   a. A = $10,000(A/P,10%,4) + $10,000(A/F,10%,5)
   b. A = [$10,000(F/P,10%,5) + 10,000](A/F,10%,5)
   c. A = $10,000(P/F,10%,2)(A/P,10%,5) + 10,000(A/F,10%,5)
   d. A = $10,000(P/F,5%,2)(A/P,5%,10) + $10,000(A/F,5%,10)

12. Alternative X has a first cost of $5 million and an annual maintenance cost of $200,000. Alternative Y has a first cost of $7 million, a maintenance cost of $40,000 and periodic expenditures of $100,000 every five years. If both alternatives have infinite lives, the equation that will yield the rate of return on the incremental investment is:
   a. 0 = -$2 million + 160,000/i + 100,000(A/F,i,5)/i
   b. 0 = -$2 million + 160,000/i - 100,000(A/F,i,)/i
   c. 0 = -$2 million + 160,000/i + 100,000(A/F,i,5)
   d. 0 = -$2 million + 160,000/i + 100,000(P/F,i,5)

13. The period of time (years) that results in the minimum equivalent uniform annual cost (EUAC) of owning and operating an asset is called:
   a. Useful life
   b. Physical Life
   c. Ownership life
   d. Economic life

14. A dimensionless number that expresses the ratio of cost estimates at two different times is a _____
   a. Power sizing
   b. Cost capacity factor
   c. Cost index
   d. Cost sizing

15. A 50-hp turbine pump was purchased for $2,100. If the exponent in the cost-capacity equation has a value of 0.76, a 200-hp turbine pump could be expected to cost about:
   a. $6,020
   b. $5,320
   c. $4,890
   d. $4,260

16. In evaluating three mutually exclusive alternatives by the B/C method, the alternatives are ranked A, B, and C, respectively, in terms of increasing cost and the following results are obtained for the overall B/C ratios: 1.1, 0.9, and 1.06. On the basis of these results, you should
   a. Select A
   b. Select C
   c. Select A and C
   d. Compare A and C incrementally

17. The method that does not necessarily produce a declining pattern of depreciation over an asset's service life is:
   a. The double-declining-balance method.
   b. The units-of-production method.
   c. Straight line method
   d. The sum-of-the-years'-digits method.

18. The first cost of a permanent road that will improve access to a rural area is $1,000,000. The annual maintenance cost is expected to be $20,000 per year. Improved accessibility will result in benefits of $70,000 per year. At an interest rate of 6% per year, the conventional B/C ratio is nearest to:
    a. 0.875
    b. 1.75
    c. 0.750
    d. 1.25

19. The depreciation charge for a 5-year, straight line depreciated vehicle is $3000 in year 4. If the first cost was $20,000, the salvage value used in the depreciation calculation was closest to:
    a. $0
    b. $2,500
    c. $5,000
    d. $7,500

20. When the measure of worth is plotted versus percent change for several parameters, the parameter that is the most sensitive in the economic analysis is the one:
    a. With the largest present worth
    b. That has the steepest curve
    c. That has the flattest curve
    d. With the shortest life

KATHMANDU UNIVERSITY
End Semester Examination
February/March, 2018

MAR 0 9 2018

Level : B. E./ B. Sc./B. Pharm./B. Tech. Course : MGTS 301
Year : III Semester : I
Time : 2 hrs. 30 mins. F. M. : 55

SECTION "B"

Attempt **ALL** the questions. Missing parameters can be assumed suitably.

1 **a.** What is economics? How is it important in your field of study? **[2]**

b. In a learning curve application, 846.2 hours are required for the third production unit and 783.0 work hours are required for the fifth production unit. Determine the value of n (the learning curve exponent) and s (the learning curve slope parameter). **[2]**

c. A cell phone company has a fixed cost of $1,000,000 per month and a variable cost of $20 per month per subscriber. The company charges $29.95 per month per subscriber. The company charges $29.95 per month to its cell phone customers. **[3]**
i. What is the breakeven point for this company?
ii. The company currently has 95,000 subscribers and proposes to raise its monthly fees to $39.95 to cover add-on features such as text messaging, song downloads, game playing, and video watching. What is the new breakeven point if the variable cost increased to $25 per customer per month?
iii. If 20,000 subscribers will drop their service because of the monthly fee increase in part (ii), will the company still be profitable?

d. A large wood products company is negotiating a contract to sell plywood overseas. The fixed cost that can be allocated to the production of plywood is $ 900,000 per month. The variable cost per thousand board feet is $131.50. The price charged will be determined by p = $ 600 – (0.5) D per 1,000 board feet. (i) Determine the optimal monthly sales volume for this product and calculate the profit (or loss) at the optimal volume. (ii) What is the domain of profitable demand during a month? **[3]**

2 **a.** The Macintosh Company has an employee savings plan that allows every employee to invest up to 5% of his or her annual salary. The money is invested in company common stock with the company guaranteeing that the annual return 'rill never be less than 8%. Jill was hired at an annual salary of $52,000. She immediately joined the savings plan investing the full 5% of her salary each year. If Jill's salary increases at an 8%uniform rate, and she continues to invest 5% of it each year, what amount of money is she guaranteed to have at the end of 20 years? **[4]**

b. A textile mill has just purchased a lift truck that has a useful life of five years. The engineer estimates that maintenance costs for the truck during the first year will be $1,000. As the truck ages, maintenance costs are expected to increase at a rate of $250 per year over the remaining life. Assume that the maintenance costs occur at the end of each year. The firm wants to set up a maintenance account that earns 12% annual interest. All future maintenance expenses will be paid out of this account. How much does the firm have to deposit in the account now? **[3]**

c. A contractor wishes to set up a special fund by making semiannual end-of-period deposits for 20 years. The fund is to provide $10,000 at the end of each of the last 5 years of the deposit period. If interest if 8%, compounded semiannually, what is the required semiannual deposit? **[3]**

3 **a.** What are the problems associated with ranking of projects by IRR method? **[1]**
Three mutually exclusive design alternatives are being considered. The estimated cash flows for **[5]**

each alternative are given below. The MARR is 20% per year. At the conclusion of the useful life, the investment will be sold.

	X	Y	Z
Investment cost	$28,000	$55,000	$40,000
Annual expenses	15,000	13,000	22,000
Annual revenues	23,000	28,000	32,000
Market value	6,000	8,000	10,000
Useful life	10 years	10 years	10 years
IRR	26.4%	24.7%	22.4%

A decision-maker can select one of these alternatives or decide to select none of them. Use the IRR method (incrementally) to make a recommendation.

OR

Two mutually exclusive alternatives are being considered for the environmental protection equipment at a petroleum refinery. One of the alternatives must be selected. The estimated cash flows for each alternative are as follows:

	Alternative A	Alternative B
Capital investment	$20,000	$38,000
Annual expenses	5,500	4,000
Market value at end of useful life	1,000	4,200
Useful life	5 years	10 years

i. Which environmental protection equipment alternative should be selected? The firm's MARR is 20% per year. Assume the equipment will be needed indefinitely. [3]

ii. Assume study period if shortened to five years. The market value of Alternative B after five years is estimated to be $15,000. Which alternative would you recommend? [3]

b. For equipment that has a first cost of $10,000 and the estimated operating costs and year-end salvage values shown below, determine the economic service life at i = 10% per year. [4]

Year	Operating Cost ($ per year)	Salvage value ($)
1	-1000	7000
2	-1200	5000
3	-1300	4500
4	-2000	3000

4 a. Explain various types of cost and revenue estimates. [2]

b. The capital investment in the system is $65,000, and the projected annual savings are given below. The system's market value at the end of fifth year is negligible, and the MARR is 18% per year. What is the discounted payback period for this investment? [3]

EOY	1	2	3	4	5
Savings ($)	25,000	30,000	30,000	40,000	46,000

c. In the development of a publicly owned, commercial waterfront area, two possible independent plans are being considered. Their costs and estimated benefits are as follows: **[5]**

Present worth ($000)		
Plan	Costs	Benefits
A	$123,000	$139,000
B	135,000	150,000

i. Which plan(s) should be adopted, if any, if the controlling board wishes to invest any amount required, provided that the B–C ratio on the required investment is at least 1.0?
ii. Suppose that 10% of the costs of each plan are reclassified as disbenefits. What percentage change in the B–C ratio of each plan results from the reclassification?

5 a. A company has purchased a property for $840,000 that contains an estimated 60,000 tons. Compute the depreciation charges for the first three years, if a production (or extraction) of 3000 tons, 5000 tons, and 6000 tons are planned for years 1, 2, and 3, respectively. Use the cost-depletion methods, assuming no salvage value for the property. **[2]**

b. A machine costs $5000 and has an estimated salvage value of $1000 at the end of 5 years useful life. Compute the depreciation schedule for the machine by Straight line (SL) and Double declining balance (DDB) **[3]**

c. The Ford Motor Company is considering three mutually exclusive electronic stability control systems for protection against rollover of its automobiles. The investment (study) period is four years, and MARR is 12% per year. Data for the fixtures cost of the systems are as follows: **[5]**

	Alternatives		
	A	B	C
Capital investment	$12,000	$15,800	$8,000
Annual savings	$4,000	$5,200	$3,000
Market value (after 4 years)	$3,000	$3,500	$1,500
IRR	19.2%	18%	23%

Plot the annual worth (AW) of each alternative against MARR as the MARR varies across the range 4%, 8%, 12%, 16% and 20%. What can you generalize about the range of the MARR for which each alternative is preferred?

6 Write short notes on (*ANY TWO***)** **[5]**

a. Principles of engineering economy
b. Life cycle cost
c. Engineering economy and design process

Use following formulas if needed:
Uniform series
$(F/A, i, N) = \{(1+i)^N - 1\}/ i$
$(P/A, i, N) = \{(1+i)^N - 1\}/\{i (1+i)^N\}$
$(A/F, i, N) = i/\{(1+i)^N - 1\}$
$(A/P, i, N) = i(1+i)^N/\{(1+i)^N - 1\}$

Gradient series
$(A/G, i, N) = [\{(1+i)^N - iN-1\}/i\{(1+i)^N - 1\}]$
$(P/G, i, N) = [\{(1+i)^N - iN-1\}/i^2 (1+i)^N]$
$(P/A_1, g, i, N) = [\{1-(1+g)^N (1+i)^{-N}\}/(i-g)]$ if $i \neq g$
$(P/A_1, g, i, N) = \{N/(1+i)\}$ if $i=g$