KATHMANDU UNIVERSITY
End Semester Examination
March/April, 2017

Marks scored:

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

Course : MGTS 301
Semester : I

Exam Roll No. :

Time: 30 mins.

F.M. : 20

Registration No.:

Date APR 0 2 2017

SECTION "A"
[20 Q × 1=20 marks]

1. Which of the following statements about factors of production is false?
   a. The term 'factors of production' is another term for resources.
   b. The factor of production termed capital means the money which the owners of firms need in order to set their firms up.
   c. The factor of production termed labor means human resources.
   d. The factor or production termed land means natural resources.

2. The supply and demand model applies when three of the following four conditions are met. Which condition is not required?
   a. There must be many buyers.
   b. There must be many sellers.
   c. The buyers and sellers must trade an identical item.
   d. The item traded must be a product.

3. Carl is considering attending a concert with a ticket price of $35. He estimates that the cost of driving to the concert and parking there will total an additional $20. In order to attend the concert, Carl will have to take time off from his part-time job. He estimates that he will lose 5 hours at work, at a wage of $6 per hour. Carl's opportunity cost of attending the concert equals
   a. $85
   b. $65
   c. $55
   d. $30

4. John's mobile phone shop has a fixed cost of $ 1,500 and the following variable cost. What is John's average total cost of the 5th mobile phone?

Number of Cell Phones	Variable Cost
1	300
2	500
3	800
4	1200
5	1700

   a. 340
   b. 500
   c. 640
   d. 1700

5. The length of time required for money to double in value at an interest rate of 6% per year is nearest to:
   a. 9 years
   b. 6 years
   c. 15 years
   d. 12 years

6. An interest rate of effective 12% per year compounded monthly is nearest to:
   a. 12 years
   b. 24 years
   c. 18 years
   d. Nominal 11.39% per year compounded monthly.

7. The construction cost of a permanent park is $600,000. Annual maintenance and operation costs are $120,000 per year. At an interest rate of 10% per year, the capitalized cost of the park is nearest to:
   a. $1,200,000
   b. $600,000
   c. $1,800,000
   d. $720,000

8. Which of the following statements is incorrect?

a. The simplicity of the payback period method is one of its most appealing qualities even though it fails to measure project profitability.

b. If two investors are considering the same project, the payback period will be longer for the investor with the higher MARR.

c. Considering the cost of funds in a payback calculation is equivalent to finding the time period when the project balance becomes zero.

d. If you were to consider the cost of funds in a payback period calculation, you would have to wait longer to breakeven as you increase the interest rate.

9. If you deposit $1,000 now and are promised payments of $500 three years from now and $1,500 five years from now, the equation that will yield the correct rate of return is:

a. $0 = 1000 + 500(P/F,i,3) + 1500(P/F,i,5)$

b. $-1000 = 500(P/F,i,3) + 1500(P/F,i,5)$

c. $1000 = -500(P/F,i,3) - 1500(P/F,i,5)$

d. $0 = -1000 + 500(P/F,i,3) + 1500(P/F,i,5)$

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. $200,000

b. $4,500,000

c. $3,000,000

d. $3,200,000

11. In an incremental investment rate of return analysis of multiple mutually exclusive alternatives that have different lives, the incremental investment cash flow must extend through:

a. The life of the longer of the two alternatives under consideration

b. The longest life of all of the alternatives under consideration

c. The least common multiple of the lives of the two alternatives under consideration

d. The least common multiple of the lives of all of the alternatives under consideration

12. If an investment triples in value in seven years, the rate of return on the investment(= i) is nearest to:

a. 6%

b. 17%

c. 25%

d. 35%

13. In the opportunity cost or conventional approach, the defender's 'first cost' is considered to be its _____.

a. Sunk costs

b. Marginal costs

c. Presently owned

d. Current market value

14. Use the power-sizing model to estimate the cost of a piece of equipment that has 75% more capacity than a similar piece of equipment that cost $1,000. The appropriate power sizing exponent for this type of equipment is 0.725.

a. $725

b. $750

c. $1,500

d. $1,750

15. Use the cost index method to estimate the current construction cost for a building equivalent to one constructed in 1980 at a cost of $2.7 million. According to the Engineering News-Record, the 1980 average Building Cost Index was 1941. Suppose that the current year Building Cost Index has been estimated at 3620.

a. $5.400 million

b. $5.036 million

c. $5.170 million

d. $3.620 million

16. In evaluating an alternative which has benefits, disbenefits and costs, the conventional B/C ratio is written as:

a. $\dfrac{\text{Benefits + Disbenefits}}{\text{Costs}}$

b. $\dfrac{\text{Benefits - Disbenefits}}{\text{-Costs}}$

c. $\dfrac{\text{Benefits - Disbenefits}}{\text{Costs}}$

d. $\dfrac{\text{Benefits}}{\text{Costs - Disbenefits}}$

17. A project costs $60,000 with an estimated annual return of $15,000 for the next 5 years. There is no salvage value. Based on an 18% interest rate, the benefit-cost ratio is approximately
    a. 0.78
    b. 1.28
    c. 1.45
    d. 4.00

18. The annual equivalent costs of retaining a defender over its 3 year remaining life and the annual equivalent operating costs for its challenger over its 4 year physical life are given below. Use MARR of 12% and determine the optimal replacement time. Assume an infinite planning horizon and no technological change (cost) in the challenger. What would be your decision?

Holding Period	Annual equivalent cost	
	Defender (In NRs)	Challenger (In NRs)
1	3100	5100
2	2600	4100
3	3300	3200
4		4600

    a. Replace 1 year later
    b. Replace now
    c. Replace 3 years later
    d. Replace 2 years later

19. A company has purchased a die set for forming sheet metal automobile fenders. The set cost $750,000 and has the capability of forming 125,000 parts. The set of dies have no value at the end of life. In the first year, 55,000 parts were manufactured. How much depreciation may be taken for that year?
    a. $55,000
    b. $750,00
    c. $330,000
    d. $125,000

20. If the sensitivity of several parameters is shown on one graph, the scale of the x-axis should be _____ from the most likely estimated value.
    a. Increment deviation
    b. Percentage deviation
    c. Measure of worth
    d. Parameter(s)

KATHMANDU UNIVERSITY
End Semester Examination
March/April, 2017

APR 0 2 2017

Level : B. E. /B. Pharm. /B. Tech.
Year : III
Time : 2 hrs. 30 mins.

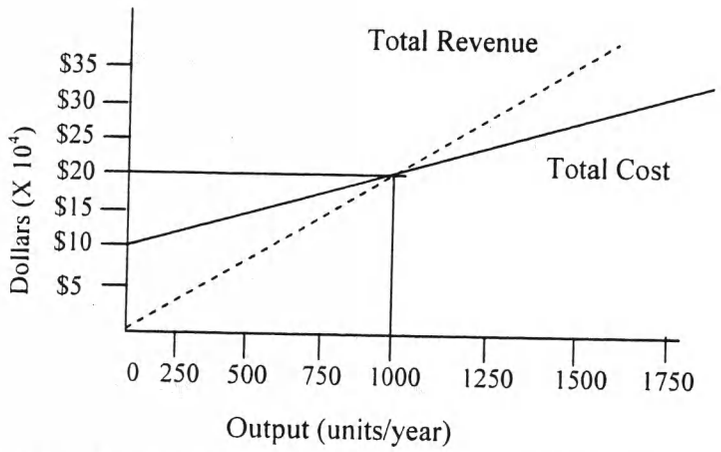
Course : MGTS 301
Semester : I
F. M. : 55

SECTION "B"

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

1 a. Why do you think the knowledge of economics is important to the technical managers? Illustrate with suitable examples. **[1]**

b. Consider the accompanying breakeven graph for an investment and answer the following questions as they pertain to the graph. **[3]**



(i) Give the equation to describe total revenue for x units per year.
(ii) Give the equation to describe total costs for x units per year.
(iii) What is the "breakeven" level of x in terms of costs and revenues?
(iv) If you sell 1500 units this year, will you have a profit or loss? How much?

c. What is cost? Explain various types of costs originate in manufacturing or construction work. **[3]**

d. A company requires two operations to produce a certain type of a product. With the help of the cost information shown below answer the questions that follow. **[3]**

Labor costs			
	Time required for 1st piece	Learning curve coefficient	Labor cost per hour
Operation 1	1 hour 15 minutes	0.90	$8.50
Operation 2	2 hours 45 minutes	0.98	$7.75
Other costs: Factory overhead: 88% of labor cost, Material cost: $ 32.2 per unit, Packaging cost: 10% of material cost			

(i) Determine the labor cost of producing the 1000th piece.
(ii) If the company wishes to get a profit margin of 17 %, what should be the targeted selling price of the product? The company wishes to use the cost information of the 1000th piece as standard for calculation.

2 a. Chemical engineers at a Coleman Industries plant in the Midwest have determined that a small amount of a newly available chemical additive will increase the water repellency of Coleman's tent fabric by 20%. The plant superintendent has arranged to purchase the additive through a 5-year contract at $7000 per year, starting 1 year from now. He expects the annual price to increase by 12% per year thereafter for the next 8 years. Additionally, an initial investment of $35,000 was made now to prepare a site suitable for the contractor to deliver the additive. Use i=15% per year to determine the equivalent total present worth for all these cash flows. [3]

b. The success of a project depends on the effort put on the cost and revenue estimate. Explain the types of estimates and the factors on which the level of detail and accuracy of the estimate depends. Explain the various sources of estimating data. [4]

c. A low-cost noncontact temperature measuring tool may be able to identify railroad car wheels that are in need of repair long before a costly structural failure occurs. If BNF Railroad saves $100,000 in years 1 through 5, $110,000 in year 6, and constant amounts increasing by $10,000 each year through year 20, what is the equivalent annual worth over the 20 years of the savings? The interest rate is 10% per year. [3]

3 a. Lucky Lindy has just won $20,000 and wants to invest it for 12 years. There are three plans available to her. [4]

(i) A savings account that pays 3¼% per year, compounded daily.
(ii) A money market certificate that pays 6¾% per year, compounded semiannually.
(iii)An investment account that based on past experience is likely to pay 8½% per year.

If Lindy does not withdraw the interest, how much will be in each of the three investment plans at the end of 12 years? Which plan would you recommend her to choose?

b. The new machine costs $10,000 and will have operating costs of $2,000 in the first year, increasing by $800 per year thereafter. The expected salvage value is $6,000 after one year and will decline 15% each year. The company requires a rate of return of 15%. Find the economic service life for this machine. [You can stop your calculation once you compute economic service life] [6]

4 a. A project engineer is assigned to provide computer networking and internet access to an office building. After research various equipment suppliers' two alternatives are detailed for further economic analysis. Alternative A is a wireless network with lower acquisition costs but higher operational costs. Alternative B is a wired network with low operational costs but higher equipment and installation costs. The costs associated with each of two alternatives are outlined below. Using the information provided below, determine which alternative to recommend using PW analysis. Assume a 10% interest rate. [5]

Alternative A wireless Network			Alternative B wired Network	
Design	$1,000		Design	$2,000
Equipment	$1,000		Equipment	$2,000
Installation	$500		Installation	$2,000
Upgrades	$500 per year		Upgrades	$0
M&O*	$500 per year		M&O*	$1,000 per year
Salvage	$200		Salvage	$100
Service Life	6 years		Service Life	9 years
* Maintenance and Operation				

OR

(i) Explain with suitable example the problems associated with the ranking of alternatives with Internal Rate of Return Method. [1]

(ii) Two flight guidance systems are being evaluated for a backup control tower at a local airport. One system utilizes conventional radar, and the second uses a global positioning system (GPS). The life of Radar and GPS system is 3 and 6 years respectively, and the MARR is 12% per year. Based on the incremental internal rate of return criterion, which guidance system would you recommend? [4]

	Radar	GPS
Capital Investment	$300,000	$650,000
Annual expenses	$60,000	$30,000
Salvage value	$40,000	$90,000
Useful life	3 years	6 years

b. Two mutually exclusive proposals for improvements to an electrical distribution utility station are under consideration. One proposal is to upgrade the existing facility at a much lower cost and lower overall benefit. The second more costly proposal and potentially more beneficial alternative is to build an entirely new facility. The new facility will incorporate many cost savings including more efficient machinery, economy of scale, and automation to reduce manpower. The disbenefits associated with the new facility include use of additional public land, the need for more roads, and the disruption of traffic and transportation. The costs and benefits are outlined in table below. Using the information provided in the table below, determine which alternative to recommend using B/C analysis. Assume a 6% interest rate. [5]

	Alternative A (in thousand $)	Alternative B (in thousand $)
Initial construction costs	40,000	4,000
Annual maintenance costs	1,500	150
Annual public benefit	6,500	650
Annual public disbenefit	1,500	0
Service years	30 years	12 years

5 a. The RX Drug Company has just purchased a capsulating machine for $76,000. The plant engineer estimates the machine has a useful life of 5 years and little or no salvage value. He will use zero salvage value in the computations. Compute the depreciation schedule for the machine using: [3]

(i) Straight-line depreciation.

(ii) Double declining balance depreciation.

b. A diesel-powered generator with a cost of $65,000 is expected to have a useful operating life of 50,000 hours. The expected salvage value of this generator is $7,500. In its first operating year, the generator was operated for 5,000 hours. Determine the depreciation for the year. [1]

c. A newly established center at the department of Pharmacy, Kathmandu University is to provide testing facilities for National and International pharmaceutical companies. A consulting firm which was working for the project has proposed the following cost and revenue structure for the main equipment which is to be purchased for the center. **[6]**

Initial investment	$200,000
Annual revenue	$80,000
Annual operating cost	$40,000
Interest rate (MARR)	8%
Useful life	8 yrs
Salvage value	$30,000

The head of the center wishes to perform the sensitivity of the decision based on the Annual Worth (AW) of the equipment to be purchased over a range of ± 20% of the estimates for the parameters: Annual Revenue (R), Useful life (N) and the Interest rate (i%). Perform sensitivity analysis and based on the sensitivity diagram you have drawn, compare the sensitiveness of the parameters you have tested.

6 Write short notes on (any two) **[5]**

a. Concept of equivalence
b. Top down and bottom up approach of estimation
c. Principles of engineering economy

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 $i=g$