Mark Scored:

KATHMANDU UNIVERSITY
End Semester Examination
August, 2018

Level : B. Sc.
Year : III
Course : MGTS 301
Semester: I

Exam Roll No. :
Time: 30 mins.
F. M. : 20

Registration No.:
Date AUG 0 9 2018

SECTION "A"
[20 Q. × 1 = 20 marks]

Encircle the most appropriate answers from the given choices.

1. With interest at 8% compounded annually, how much money is required today to provide a perpetual income of 1400 per year?
   a. 18000 b. 10000 c. 17500 d. 16000

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

3. The conventional B/C ratio is written as
   a. B/C= (Benefits- Disbenefits)/Costs b. B /C= Benefits/(Costs +Disbenefits)
   c. B/C = (Benefits + Disbenefits)/Costs d. B/C= (Benefits * Disbenefits)/ Costs

4. If an investment triples in value in seven years, the rate of return on the investment is nearest to:
   a. 6% b. 17% c. 25% d. 35%

5. What uniform annual amount should be deposited each year in order to accumulate $100,000 at the end of the 5th annual deposit if money earns 10% interest?
   a. $15,890.12 b. $15,890.12 c. $16,279.75 d. $16,379.75

6. What is the decision rule of cost benefit analysis?
   a. Select the project if the B/C ratio is greater than 1
   b. Select the project if the B/C ratio is less than 1
   c. Select the project if the B/C ratio is negative.
   d. Select the project if the B/C ratio is 0

7. Which one of the following is the cost driver of any Mobile Application?
   a. internal space b. horsepower c. gross weight d. line of codes

8. A $50,000 bond with a coupon rate of 6% per year payable quarterly matures 10 years from now. At an interest rate of 8% per year compounded quarterly, the relation that correctly calculates the present worth of the remaining payments to the owner is
   a. 1500(PA,4%,20) 50,000(PF,4%,20) b. 3000(PA,8%,10) 50,000(PF,8%,10)
   c. 750(PA,1.5%,40) 50,000(PF,1.5%,40) d. 750(PA,2%,40) 50,000(PF,2%,40)

9. A replacement analysis is most objectively conducted from the viewpoint of
   a. a consultant. b. the company that originally sold the defender
   c. the company that is selling the challenger d. the maintenance department.

10. An oil refinery has decided to purchase some new drilling equipment for $550,000. The equipment will be kept for 10 years before being sold. The estimated SV for depreciation purposes is to be $25,000. Using the SL method, the BV at the end of the depreciable life is

a. $0 b. $50,000 c. $35,000 d. $25,000

11. Alternative A has a first cost of $10,000, an annual operating cost of $5,000 and a salvage value of $2,000. Alternative B has an initial cost of $25,000, an annual operating cost of $1,000 and a salvage value of $12,000. If both alternatives have a five-year life, the equation that will yield the rate of return on the incremental investment is:

a. $0 = -\$15,000 + 4,000(P/A,i,5) - 10,000(P/F,i,5)$
b. $0 = -\$15,000 - 4,000(P/A,i,5) + 10,000(P/F,i,5)$
c. $0 = \$15,000 + 4,000(P/A,i,5) + 12,000(P/F\ i,5)$
d. $0 = -\$15,000 + 4,000(P/A,i,5) + 10,000(P/F,i,5)$

12. What rate of interest compounded annually is the same as the rate of interest of 8%? compounded quarterly?

a. 8.07% b. 8.24% c. 8.12% d. 8.16%

13. If an investment triples in value in seven years, the rate of return on the investment is nearest to:

a. 6% b. 17% c. 20% d. 25%

14. A project has $15,000 in annual worth of benefits, $5,000 in annual worth of dis-benefits and $5,000 in annual worth in cost. What is the benefit cost ratio?

a. 1 b. 2 c. 3 d. 0

15. If a company invests $10,000 and receives $2,775 per year for five years, the rate of return on the investment is nearest to:

a. 12 b. 6 c. 16 d. 8

16. The PW method requires evaluation of two mutually exclusive alternatives over the least common multiple (LCM) of their lives. This is required

a. because the study period is always the LCM of the lives
b. to maximize the number of calculations to find PW
c. to ensure that the equal service assumption is not violated
d. to compare them over a period equal to the life of the longer-lived alternative

17. At an interest rate of 6% per year, the annual worth of an expenditure of $10,000 now, and $10,000 every 5 years forever, is nearest to:

a. $2,374 b. $2,974 c. $1,774 d. $600

18. For the net cash flow sequence of -$10,000 in year zero, +$3,000 in year one, -$2,000 in year two, +$8,000 in year three, and +$6,000 in year four, the number of possible rate of return values is:

a. 4 b. 1 c. 3 d. 2

19. Stan Moneymaker has a bank loan for $10,000 to pay for his truck. This loan is to be repaid in equal end of month installments for five years with a nominal interest rate of 12% compounded monthly. What is the amount of each payment?

a. 333 b. 212 c. 234 d. 222

20. How much must you invest today in order to withdraw $2,000 annually for 10 years if the interest rate is 9%?

a. $12,004 b. $12,562.09 c. $12,992.22 d. $12,835.32

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SECTION "B"

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

1. a. Explain why the subject of engineering economy is important to computer engineer. [2]
   b. Suppose your company has just discovered $100,000 worth (this is the original manufacturing cost) of obsolete inventory in an old warehouse. Your boss asks you to evaluate two options: (1) remachine the obsolete parts at a cost of $30,000 and then hopefully resell them for $60,000 or (2) scrap them for $15,000 cash (which is certain) through a secondhand market. What recommendation would you make to your boss? Explain your reasoning. [2]
   c. 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 $800,000 per month. The variable cost per thousand board feet is $155.50. The price charged will be determined by $p = \$600 - (0.05)\,D$ per 1,000 board feet. [3]
      i. For this situation, 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.
   d. The Mechanical Engineering department has a student team that is designing a formula car for national competition. The time required for the team to assemble the first car is 100 hours. Their improvement (or learning rate) is 0.8, which means that as output is doubled, their time to assemble a car is reduced by 20%. Use this information to determine [3]
      i. the time it will take the team to assemble the 10th car.
      ii. the total time required to assemble the first 10 cars.
      iii. the estimated cumulative average assembly time for the first 10 cars.

2. a. A city is spending $20 million on a new sewage system. The expected life of the system is 40 years, and it will have no market value at the end of its life. Operating and maintenance expenses for the system are projected to average $0.6 million per year. If the city's MARR is 8% per year, what is the capitalized worth of the system? [3]
   b. A large lithium-ion phosphate battery pack for an industrial application is expected to save $20,000 in annual energy expenses over its 6-year life. For a 3-year simple payback period, the permissible capital investment is $60,000. What is the internal rate of return on this $60,000 battery pack if it has a residual value of $10,000 at the end of 6 years? The MARR is 18% per year. [4]
   c. Three different bank loan rates for electric generation equipment are listed below. Determine the effective rate on the basis of the compounding period for each rate. [3]
      i. 8.75% per year, compounded quarterly.
      ii. 9.25% per year, compounded monthly.
      iii. 8.5% per year, compounded weekly.
      Which bank would you recommend? Why?

3. a. A new storm drainage system must be constructed right away to reduce periodic flooding that occurs in a city that is in a valley. Five mutually exclusive designs have been proposed, and their present worth (in thousands of dollars) of costs and benefits are the following. [5]

	System				
	1	2	3	4	5
PW of costs	$1000	4000	4000	10000	12000
PW of benefits	$8000	8000	14000	16000	24000

i. Which system has the greatest B–C ratio?
ii. 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?
iii. Which system has the largest incremental B–C ratio?
iv. What plan should be selected, if three projects are mutually exclusive?

b. Three mutually exclusive alternatives are being considered for the production equipment at a tissue paper factory. The estimated cash flows for each alternative are given here. (All cash flows are in 000 s.) [5]

	A	B	C
Capital investment	$2,000	$4,200	$7,000
Annual revenues	3,200	6,000	8,000
Annual costs	2,100	4,000	5,100
Market value at end of useful life	100	420	600
Useful life (years)	5	10	10

Which equipment alternative, if any, should be selected? The firm's MARR is 20% per year. Please state your assumptions.

4. a. Consider the following data on an asset: [4]

Cost of the asset, I	$50,000
Useful life, N	7 years
Salvage value, S	$0

Compute the annual depreciation allowances and the resulting book values, using:
i. the Straight Line (SL) method.
ii. the 200% Diminishing Balance method with switchover to SL.

b. Anew forklift truck will require an investment of $30,000 and is expected to have year-end MVs and annual expenses as shown in the table below. If the before-tax MARR is 10% per year, how long should the asset be retained in service? [6]

End of Year, k	Market Value, End of Year, k	Annual Expenses (E_k)
0	$30,000	
1	22,500	$3,000
2	16,875	4,500
3	12,750	7,000
4	9,750	10,000
5	7,125	13,000

5. a. You owe your best friend $2,000. Because you are short on cash, you offer to repay the loan over 12 months under the following condition. The first payment will be $ 100 at the end of month one. The second payment will be $100 + G at the end of month two. At the end of month three, you'll repay $100 + 2G. This pattern of increasing G amounts will continue for all remaining months. [4]
   i. What is the value of *G* if the interest rate is 0.5% per month?
   ii. What is the equivalent uniform monthly payment?
   iii. Repeat Part (i) when the first payment is $150 (i.e., determine *G*).

   b. Consider a proposal to enhance the vision system used by a postal service to sort mail. The new system is estimated to cost 1.1 million and will incur an additional 200,000 per year in maintenance costs. The system will produce annual savings of 500,000 each year (primarily by decreasing the percentage of misdirected mail and reducing the amount of mail that must be sorted manually). The MARR is 10% per year, and the study period is five years at which time the system will be technologically obsolete (worthless). The PW of this proposal is PW (10%) = − 1,100,000 + (500,000 − 200,000) (P/A, 10%, 5) = 37,236. (This gives PW at 0% change)
   Determine how sensitive the decision to invest in the system is to the estimates of investment, annual cost and annual savings. What are the decision reversal points? (This gives you PW = 0). Draw Spider Plot or Sensitivity Graph for initial investment, annual cost and annual savings), as you already have two points to draw straight line for each variable. [6]

6. Write short notes on (*ANY TWO*) [5]
   a. Top-down and bottom-up approach of cost estimation
   b. Market competition
   b. External rate of return (ERR)

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

   Gradient Series
   $$\left\{\frac{1}{i}\left[\frac{(1+i)^N - 1}{i(1+i)^N} - \frac{N}{(1+i)^N}\right]\right\}$$