KATHMANDU UNIVERSITY
End Semester Examination
July/August, 2024

Marks Scored:

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

Course : MGTS 301
Semester : II

Exam Roll No. :

Time: 30 mins.

F. M. : 10

Registration No.:

Date : 23 AUG 2024

SECTION "A"

[20 Q. × 0.5 = 10 marks]

Choose and encircle the most appropriate option from each set of choices

1. _____ is one that has occurred in the past and has no relevance to estimates of future costs and revenues related to and alternative course of action.
   a. Incremental cost b. Sunk cost c. Disposal cost d. Overhead cost

2. A manufacturing company leases a building for $100,000 per year for its manufacturing facilities. In addition, the machinery in this building is being paid for in installments of $20,000 per year. Each unit of the product produced costs $15 in labor and $10 in materials. The product can be sold for $40. How many units per year must be sold for the company to breakeven?
   a. 4,800 units b. 3,000 units c. 8,000 units d. 6,667 units

3. _____ are easily assignable to a specific product, while _____ are not easily allocated to a certain product.
   a. Standard costs; incremental costs
   b. Variable costs; fixed costs
   c. Direct costs; indirect costs
   d. Opportunity costs; overhead costs

4. A _____ is a mathematical model that explains the phenomenon of increased worker efficiency and improved organizational performance with repetitive production of a good or service.
   a. factor technique
   b. learning curve
   c. cost estimating relationship
   d. spider plot

5. 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

6. Which of the following is used to establish economic equivalence between cash flows occurring at different times?
   a. Inflation rate b. Exchange rate c. Interest rate d. Depreciation rate

7. The true value of interest rate computed by equations for compound interest for one-year period is known as _____.
   a. Expected return b. Compound interest c. Nominal interest d. Effective interest

8. A new engineering graduate who started a consulting business borrowed money for 1 year to furnish the office. The amount of the loan was $23,800, and it had an interest rate of 10% per year. However, because the new graduate had not built up a credit history, the bank made him buy loan-default insurance that cost 5% of the loan amount. In addition, the bank charged a loan setup fee of $300. What was the effective interest rate the engineer paid for the loan?
   a. 10% b. 12.5% c. 16.9% d. 18%

9. If an investment of $2,000 is compounded semiannually at an annual interest rate of 8%, what will be its value after five years?
a. $2,938.80 b. $2,985.84 c. $3,040.00 d. $3,193.86

10. A bank advertises mortgages at 12% compounded continuously. What is the effective annual interest?
a. 12.36% b. 12.55% c. 12.75% d. 12.68%

11. Suppose that a market survey has shown that the best competitor's selling price is $27.50 per assembly. If a profit margin of 10% (based on total manufacturing cost) is desired, what should be the target cost of the assembly?
a. $26.21 b. $25.00 c. $28.83 d. $29.31

12. When you were born, your grandfather established a trust fund for you. The account has been earning interest at the rate of 10% per year. If this account will be worth $100,000 on your 25th birthday, how much did your grandfather deposit on the day you were born?
a. $4,000 b. $9,230 c. $10,000 d. $10,740

13. How long would it take to accumulate $10,000 in a savings account when P = $5,000 and i = 10% per year?
a. 5.5 years b. 6.3 years c. 7 years d. 8.1 years

14. A heating system is being considered for a small office building. The system can be purchased and installed for $110,000, and it will save an estimated 300,000 kilowatt-hours of electric power each year over a six-year period. A kilowatt-hour of electricity costs $0.10, and the company used a MARR of 15% per year in its economic evaluations of refurbished systems. The market value of the system will be $8,000 at the end of six years, and additional operating and maintenance expenses are negligible. The PW of this proposal is expressed as:
a. PW (15%) = $110,000 + $30,000 (A/P, 15%, 6) + $8,000 (F/P, 15%, 6)
b. PW (15%) = - $110,000 + $30,000 (P/A, 15%, 6) + $8,000 (F/P, 15%, 6)
c. PW (15%) = - $110,000 + $30,000 (P/A, 15%, 6) + $8,000 (P/F, 15%, 6)
d. PW (15%) = $110,000 + $30,000 (A/P, 15%, 6) + $8,000 (P/F, 15%, 6)

15. In comparing mutually exclusive alternatives by the rate of return (ROR) method, you should:
a. Find the ROR of each alternative and choose the one with the highest ROR.
b. Select the alternative whose incremental ROR is the highest.
c. Select the alternative with ROR>MARR that has the lowest initial investment cost.
d. Select the alternative with the largest initial investment that has been incrementally justified.

16. The owner of a workshop is planning to purchase a special machine for $50,000. The annual operating cost is expected to be $8,000 per year. If the machine has a useful life of 12 years, what is the minimum required annual equivalent revenue needed to breakeven with an 8% annual interest rate? Assume that machine would have an estimated market value of $5,000 at the end of its useful life.
a. $5,972 b. $8,000 c. $6,372 d. $14,371

17. When comparing alternatives that have different lives by the AW method, you must:
a. Find the AW of each over the life of the longest-lived alternative.
b. Find the AW of each over the life of the shortest-lived alternative.
c. Find the AW of each over the LCM of all of the alternatives.
d. Find the AW of each alternative over its life without considering the life of the other alternatives.

18. The depreciation charge for a five-year, straight line depreciated vehicle is $3,000 in forth year. If the cost basis was $20,000, what is the salvage value used in the depreciation calculation?
a. $0 b. $2,500 c. $5,000 d. $7,500

19. A company is considering replacing a machine that was bought six years ago for $50,000. The machine, however, can be repaired and its life extended by five more years. If the current machine is replaced, the new machine will cost $44,000 and will reduce the operating expenses by $6,000 per year. The seller of the new machine has offered a trade-in allowance of $15,000 for the old machine. If MARR is 12% per year before taxes, how much can the company spend to repair the existing machine?
a. $22,371 b. $50,628 c. $7,371 d. -$1,000

20. The following annual maintenance and operation costs for a piece of equipment were collected over a five-year period: $12,300, $6,900, $9,200, $11,000, and $12,100. The average is $10,700. In conducting a sensitivity analysis, the most reasonable range of costs to use (i.e., percent from the average) is:
a. ±5% b. ±11% c. ±17% d. ±25%

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SECTION "B"
[6 Q. × 4 = 24 marks]

Attempt *ANY SIX* questions.

1. In your own words, describe the life cycle cost concept. Why is the potential for achieving life-cycle cost savings greatest in the acquisition phase of the life cycle?

2.
   a. Suppose you have $10,000 cash today and can invest it an interest rate of 10% compounded each year. How many years will it take you to become a millionaire?
   b. A 40-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?

3. A household spends $10,000 more than it makes and its does this for eight consecutive years. If this debt will be financed at an interest rate of 15% per year, what annual repayment will be required to repay the debt over a ten-year period (repayment will start at end-of-year nine)?

4. Consider that you are the manager of a large crude-oil refinery. As part of the refining process, a certain heat exchanger (operated at high temperatures and with abrasive material flowing through it) must be replaced every year. The replacement and downtime cost in the first year is $175,000. This cost is expected to increase due to inflation at a rate of 8% per year for five years, at which time this particular heat exchanger will no longer be needed. If the company's cost of capital is 18% per year, how much could you afford to spend for a higher quality heat exchanger so that these annual replacement and downtime costs could be eliminated?

5. After your graduation, you have been offered an engineering job with a large company that has offices in Tennessee and Ohio. The salary is $50,000 per year at either location. Tennessee's tax burden (state and local taxes) is 8.6% of income, while Ohio's is 12%. If you accept the position in Tennessee and stay with this company for ten years, what is the future worth of the tax savings? Your personal MARR is 12% per year.

6. An assembly operation at a software company currently requires $100,000 per year in labor costs. A robot can be purchased and installed to automate this operation, and the robot will cost $200,000 with no market value at the end of its 10-year life. Maintenance and operation expenses of the robot are estimated to be $64,000 per year. The invested capital must earn at least 12% per year. Use the IRR method to determine if the robot is a justifiable investment.

7. A small start-up biotech firm anticipates that it will have cash outflows of $200,000 per year at the end of the next three years. Then the firm expects a positive cash flow of $50,000 at the end of forth year and positive cash flows of $250,000 at the end-of- year five through nine. Based on these estimates, would you invest money in this company if your MARR is 15% per year?

P.T.O.

SECTION "C"

[2 Q. × 8 = 16 marks]

Attempt *ANY TWO* questions.

8. A municipal police department has decided to acquire an unmanned drone for aerial surveillance of a high-crime region of their city. Three mutually exclusive drones are being studied. All alternatives have a life of 10 years, and they have negligible market (salvage) value after 10 years. The police department's MARR is 10% per year. Which drone should be selected? Use the IRR method (incrementally) to make your recommendation.

Alternative	Capital Investment	Annual Expenses
Multi-Rotor	$740,000	$361,940
Fixed-Wing	$1,840,000	$183,810
Single-Rotor	$540,000	$420,000

9. Two proposals have been offered for streamlining the business operations of a customer call center. One proposal has an investment cost of $30,000, an expected life of five years, property taxes of $450 per year. Annual expenses are estimated to be $6,000. On the other hand, the another one has an investment cost of $38,000, an expected life of four years, property taxes of $600 per year. Its annual operating expenses are expected to be $4,000. Both of these investments have no market value. Using a MARR = 10% per year, which proposal should be recommended? State your assumption(s).

10. The Ajax Corporation has an overhead crane that has an estimated remaining life of 10 years. The crane can be sold now for $8,000. If the crane is kept in service, it must be overhauled immediately at a cost of $4,000. Operating and maintenance costs will be $3,000 per year after the crane is overhauled. The overhauled crane will have zero MV at the end of the 10-year study period. A new crane will cost $18,000, will last for 10 years, and will have a $4,000 MV at that time. Operating and maintenance costs are $1,000 per year for the new crane. The company uses a before-tax interest rate of 10% per year in evaluating investment alternatives. Should the company replace the old crane?