KATHMANDU UNIVERSITY
End Semester Examination [C]
June/July 2024

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

10 JUL 2024

Course : MGTS 301
Semester : I
F. M. : 40

SECTION "B"
[6Q. × 4 = 24 marks]

Attempt *ANY SIX* questions.

1. How does the concept of opportunity cost influence your everyday decisions, whether it's choosing between different job offers, allocating time between tasks, or deciding how to spend your money? How the study of economics does help to tackle these choices.

OR

Tamrakar & Sons Company produces an special electronic device that is used in aeronautical products. The fixed cost (C_F) is \$73000 per month, and the variable cost (C_V) is \$83 per unit. The selling price per unit is p = \$180 – 0.02(D). Determine the optimal volume and the optimal profit at this demand and also find the range of profitable demand.

2. CFL bulb of 20 watt costs Rs. 250 whereas Filament bulb of 100 watt (20 watt CFL bulb is equivalent to 100 watt Filament bulb) costs Rs. 30. Which bulb do you prefer in your house for 50 days if you light the bulb 4 hours per day in an average.? Electricity cost is Rs. 10 per unit (KW-hour)

3. A reputed telecommunication lends money on the following terms: "If I give you \$20 today, you owe me \$22 after a week.", what nominal interest rate per year (r) is the telecommunication charging? What effective interest rate per year (i_a) is it charging? And if the telecommunication started with \$20 and was able to keep it, as well as all the money he received, out in loans at all times, how much money would he have at the end of one year?

4. In a replacement analysis for a vacuum seal on a spacecraft, the following data are known about the challenger: the initial investment is \$12,000; there is no annual maintenance cost for the first three years, however, it will be \$2,000 in each of years four and five, and then \$4,500 in the sixth year and increasing by \$2,500 each year thereafter. The salvage value is \$0 at all times, and MARR is 10% per year. What is the economic life of this challenger? What will happen to the economic service life of the challenger, if the interest rate is 15%?

OR

A machine is purchased for \$12000 with depreciable life of 10 years with zero salvage value. Use 200% DB method with switchover to SL method. Also find the cumulative depreciation for Year 8. Why business organizations apply DB method with switchover method to SL method while changing the depreciation?

P.T.O.

5. A professor plans to create an endowment at her local community college to support education. He aims to finance a perpetual scholarship of $30,000 each year for deserving students and establish a special "Decade's Outstanding Student" award, granted every ten years and valued at $60,000. Assuming the endowment generates an annual return of 7%, what lump sum must the professor donates today to ensure the perpetual funding of these academic initiatives?

OR

Using co-terminated assumption recommend the best project taking the study period of 5 years.

Projects	A	B
Initial Investment	350000	500000
Annual Revenue	130000	175000
Annual Cost	15000	25000
Salvage Value	35000	50000
Useful Life	5 years	8 years
MARR	10%	

6. Perform sensitivity analysis of the following project over a range of ±20% in a) initial investment, b)net annual revenue and c) useful life. Analyze your answer by using spider plot.

Initial Investment	$550000
Net Annual Revenue	$150000
Salvage value	$80000
Useful Life	6 years
MARR	10%

7. Five independent projects consisting of reinforcing dams, levees, and embankments are available for funding by a certain public agency. The following tabulation shows the equivalent annual benefits and costs for each:

Projects	Annual Costs	Annual Benefits
A	$2,000,000	$1,800,000
B	4,200,000	5,600,000
C	6,800,000	8,400,000
D	2,800,000	2,600,000
E	5,400,000	6,600,000

i. Assume that the projects are of the type for which the benefits can be determined with considerable certainty and that the agency is willing to invest money as long as the B–C ratio is at least one. Which alternatives should be selected for funding?
ii. What is the rank-ordering of projects from best to worst?
iii. If the projects involved intangible benefits that required considerable judgment in assigning their values, would your recommendation be affected?

SECTION "C"

[2Q. × 8 = 16 marks]

Attempt *ANY TWO* questions.

8. In an automotive parts plant, an engineering team is analysing an improvement project to increase the productivity of a flexible manufacturing centre. The estimated net cash flows for the three feasible alternatives being compared are shown below. The analysis period is six years, and MARR for capital investments at the plant is 20% per year. Using the ERR method, which alternative should be selected? (ε = MARR)

End of Period	Alternative Cash Flows		
	A	B	C
0	-	-	-
	$640000	$680000	$755000
1	262000	-40000	205000
2	290000	392000	406000
3	302000	380000	400000
4	310000	380000	390000
5	310000	380000	390000
6	260000	380000	324000

9. Two electric motors are being considered to drive a centrifugal pump. One of the motors must be selected. Each motor is capable of delivering 60 horse power (output) to the pumping operation. It is expected that the motors will be in use 800 hours per year. The following data are available:

	Motor X	Motor Y
Capital investment	$1,200,000	$1,000,000
Electrical efficiency	0.92	0.80
Annual maintenance	$160,000	$100,000
Useful Life	3 years	6 years

If electricity costs Rs. 7 per kilowatt-hour, which motor should be selected if the MARR is 8% per year? Assume repeatability. (1hp = 0.746kw)

10. A company has to select from two projects: A and B. The cash flow details of Project A is: initial investment = $35000, annual revenue = $16450, annual costs = $3000, useful life = 4 years whereas Project B has initial investment = $50000, annual revenue = $25000, annual costs = $13830 and useful life of 6 years. Both the projects have zero salvage value. Help the company select the best project using IRR method.

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Time: 30 mins.
F. M. : 10

Registration No.:
Date : 10 JUL 2024

SECTION "A"
[20Q. × 0.5 =10 marks]

Choose and encircle the most appropriate option from the given choices.

1. In the context of economics being a normative science, which statement best reflects its characteristic?
   a. Economics is solely based on empirical observations and historical data to predict future market trends.
   b. Economics aims to analyze and understand how resources should be allocated to achieve societal goals.
   c. Economics primarily focuses on mathematical models and formulas to explain market behaviors.
   d. Economics is restricted to studying the theoretical aspects of consumer behavior without considering real-world applications.

2. A country decides to allocate its resources between producing two goods, X and Y. The production possibilities are such that increasing the output of good X will lead to a decrease in the output of good Y, and vice versa. This scenario illustrates the economic concept of:
   a. Comparative advantage
   b. Marginal utility
   c. Opportunity cost
   d. Perfect competition.

3. In the realm of economics, the learning curve primarily illustrates:
   a. The oscillation between economies of scale and diseconomies of scale as production scales up.
   b. The convergence of technology and market demand affecting the cost structure of a firm.
   c. The direct correlation between consumer preferences and the marginal utility of a product.
   d. The nonlinear relationship between cumulative production and the decline in average cost per unit due to enhanced efficiency.

4. Snigdha Raj has just won $10,000 and wants to invest it for 12 years. An investment account that based on past experience is likely to pay 5% per year. If Snigdha Raj does not withdraw the interest, how much will be in the investment plans at the end of 12 years?
   a. 17985.6 b. 19255.4 c. 21030.6 d. 24930.6

5. What is the present worth of the geometric gradient cash flow which begins with $800 at EOY one and decrease by 10% per year after the first year till year 4, if the interest rate is 15%?
   a. 3000.25 b. 3000 c. 2466.5 d. 2000

6. What is the effective interest for a 7% nominal rate, compounded monthly?
a. 7.23% b. 7.35% c. 7.56% d. 7.48%

7. An effective annual interest rate of 30% has been determined with continuous compounding. What is the nominal interest rate that was compounded continuously to get this number?
a. 36.24% b. 26.24% c. 24.36% d. 24.26%

8. In engineering economy, MARR (Minimum Acceptable Rate of Return) is best defined as:
a. The aggregate weighted average of interest rates across global financial markets for long-term investments.
b. The projected internal rate of return (IRR) used exclusively for evaluating high-risk ventures in specialized industries.
c. The minimum threshold rate of return reflecting the opportunity cost of capital for a specific investment or project.
d. The nominal interest rate adjusted for inflation, representing the standard return expectation for venture capitalists.

9. The internal rate of return is defined as the interest rate that gives
a. the highest profitability for a project
b. the present value of cash flows
c. the same PV of cash inflows and outflows
d. a positive net present value

10. Projects A and B are mutually exclusive. If project A, the larger project, has an approximate ERR of 20 percent and project B has an approximate ERR of 13 percent, which project is better if the Minimum Acceptable Rate of Return (MARR) is 12%?
a. Project A
b. Project B
c. Incremental ERR required to select the project
d. Neither A & B

11. A 5-year project has an initial cost of $35,000, annual net cash inflows of $16,000, and a salvage value of $5,000 after five years. Which of the following gives the project's present worth?
a. 16,000(P/A, 10, 5) + 5,000(P/F, 10, 5) - 35,000
b. 16,000(P/A, 10, 5) + 5,000(F/P, 10, 5) - 35,000
c. 16,000(A/P, 10, 5) + 5,000(P/F, 10, 5) - 35,000
d. 35,000 + 16,000(P/F, 10, 5) + 5,000(P/A, 10, 5)

12. Concerning the Payback Period method in project evaluation, which statement accurately characterizes its assessment?
a. It assesses the time taken for a project to regain half of the initial investment, often neglecting the latter half.
b. It calculates the time required for a project to achieve a return equal to the initial investment, discounting future cash flows.
c. It evaluates the period for a project to recuperate the entire initial investment, focusing on shorter-term cash recovery.
d. It measures the duration for a project to achieve profits exceeding the initial investment, considering long-term sustainability.

13. What does the External Rate of Return (ERR) measure in project evaluation?
    a. The project's return compared to similar investments in the external market.
    b. The rate at which a project's internal rate of return equals the hurdle rate.
    c. The profitability of a project after considering its external social and environmental impacts.
    d. The rate at which a project's cash inflows equal its cash outflows.

14. Which of the following best represents a limitation of using the Benefit-Cost Ratio (BCR) as the sole criterion for project evaluation?
    a. BCR fails to account for time preferences and discount rates, impacting the accuracy of long-term projects.
    b. BCR provides a straightforward comparison of benefits and costs, ensuring a comprehensive project evaluation.
    c. BCR is universally applicable across all industries and project types, ensuring consistent evaluations.
    d. BCR overlooks externalities and intangible factors, potentially undervaluing or neglecting significant aspects of a project's impact.

15. Which of the following best describes depreciation in economics?
    a. It represents the process of setting aside funds for future asset replacement.
    b. It is the allocation of the cost of an asset over its useful life.
    c. It signifies the increase in the market value of an asset over time.
    d. It refers to the appreciation of an asset's value in the market.

16. A new sound system has a cost basis of $6,000 and a 10-year depreciable life. The estimated SV of the sound system is zero at the end of 10 years. Use the DB method to calculate the cumulative depreciation for year 7 when R = 1.5/N (150% DB method).
    a. $5138.72 b. $339.46 c. $4076.53 d. $4852.82

17. A machine is purchased for $38,000 some years ago. It can now be sold on the open market for $16,000. The defender was purchased with cash three years ago, and its current BV is $19,000. To make this defender comparable in continued service to the challenger, your firm made some repairs at an estimated cost of $2,500. What is the actual total capital investment in the defender in the current time regarding replacement?
    a. $18500 b. $21500 c. $19000 d. $40500

18. What is the EUAC amount for year two if the laptop cost $800 and cost of capital is 10% per year. Annual expenses are $150, $200 & $300 respectively for year 1, 2 and 3 and resale values for year 1, 2 & 3 are $600, $450 and $200.
    a. $430 b. $420 c. $440 d. $470

19. ABC produces plastic bottle for children. The fixed costs incurred in the production are $50,000, and the total costs amount to $200,000. If the company sells the plastic whistles at $8 per unit and has a contribution margin of $4 per unit, what is the Break-Even Point (BEP) in terms of the number of units the company must sell?
    a. $10000 b. $12500 c. $12000 d. $10250

20. In a comprehensive sensitivity analysis of a project's Cash Flow, the base case Net Present Value (NPV) is $3,000,000. After running simulations, it's found that a 15% increase in variable costs leads to a decrease in NPV to $2,500,000. However, the impact of sales volume decrement in same percentage results in an NPV of $2,700,000. Calculate the approximate sensitivity of NPV to changes in both variable costs and sales volume.

a. Variable Costs: 10%, Sales Volume: +8%
b. Variable Costs: 20%, Sales Volume: 17.67%
c. Variable Costs: 15.67%, Sales Volume: 10%
d. Variable Costs: 16.67%, Sales Volume: 15%