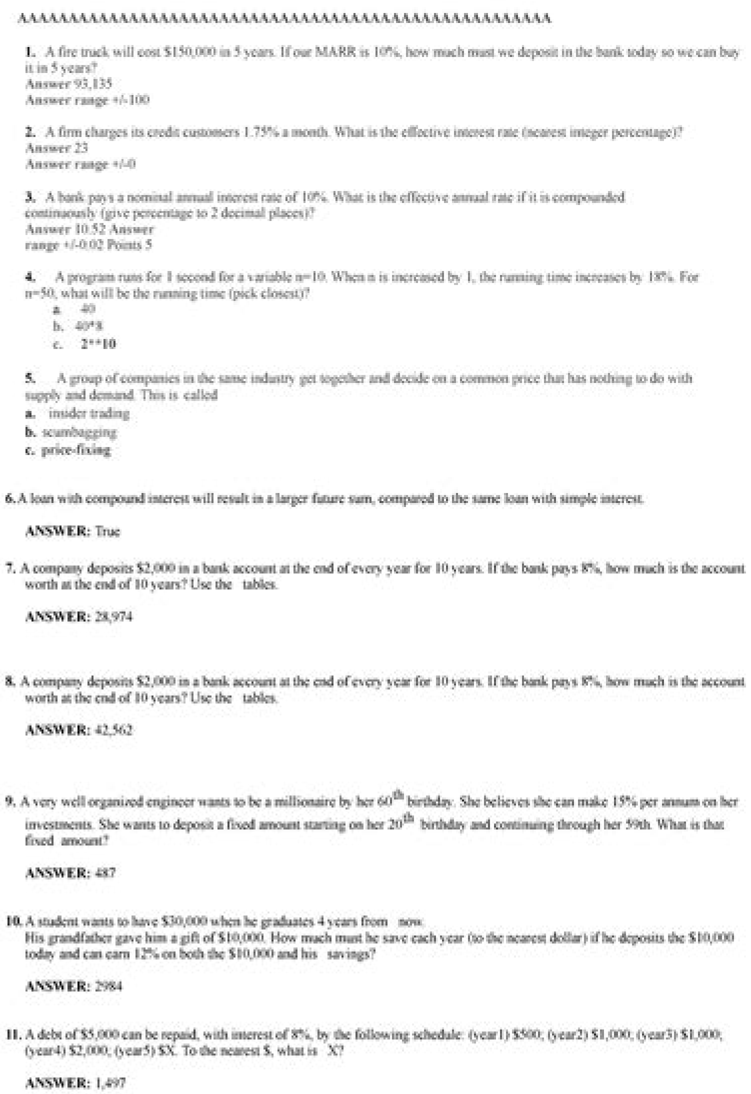
Engineering Economics Questions And Solutions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1. A fire truck will cost $150,000 in 5 years. If our MARR is 10%, how much must we deposit in the bank today so we can buy it in 5 years?
Answer 93,135
Answer range +/-100

2. A firm charges its credit customers 1.75% a month. What is the effective interest rate (nearest integer percentage)?
Answer 23
Answer range +/-0

3. A bank pays a nominal annual interest rate of 10%. What is the effective annual rate if it is compounded continuously (give percentage to 2 decimal places)?
Answer 10.52 Answer
range +/-0.02 Points 5

4. A program runs for 1 second for a variable n=10. When n is increased by 1, the running time increases by 18%. For n=50, what will be the running time (pick closest)?
a. 40
b. 40*8
c. 2**10

5. A group of companies in the same industry get together and decide on a common price that has nothing to do with supply and demand. This is called
a. insider trading
b. scumbagging
c. price-fixing

6. A loan with compound interest will result in a larger future sum, compared to the same loan with simple interest.

ANSWER: True

7. A company deposits $2,000 in a bank account at the end of every year for 10 years. If the bank pays 8%, how much is the account worth at the end of 10 years? Use the tables.

ANSWER: 28,974

8. A company deposits $2,000 in a bank account at the end of every year for 10 years. If the bank pays 8%, how much is the account worth at the end of 10 years? Use the tables.

ANSWER: 42,562

9. A very well organized engineer wants to be a millionaire by her 60th birthday. She believes she can make 15% per annum on her investments. She wants to deposit a fixed amount starting on her 20th birthday and continuing through her 59th. What is that fixed amount?

ANSWER: 487

10. A student wants to have $30,000 when he graduates 4 years from now.
His grandfather gave him a gift of $10,000. How much must he save each year (to the nearest dollar) if he deposits the $10,000 today and can earn 12% on both the $10,000 and his savings?

ANSWER: 2984

11. A debt of $5,000 can be repaid, with interest of 8%, by the following schedule: (year1) $500; (year2) $1,000; (year3) $1,000; (year4) $2,000; (year5) $X. To the nearest $, what is X?

ANSWER: 1,497

Engineering economics questions and solutions are vital components in the field of engineering that help professionals make informed financial decisions regarding projects and investments. Engineering economics combines principles of economics with engineering practices to evaluate the feasibility and profitability of projects. This article will explore common engineering economics questions, provide solutions, and highlight important concepts that every engineering professional should understand.

Understanding Engineering Economics

Engineering economics is the study of the economic aspects of engineering projects. It involves assessing the cost-effectiveness of various engineering alternatives and making decisions that maximize the value of investments. By understanding the principles of engineering economics, engineers can contribute to the overall success of projects by ensuring that resources are allocated efficiently.

Key Concepts in Engineering Economics

Before diving into specific questions and solutions, it is essential to understand some key concepts in engineering economics:

- **Time Value of Money:** This principle states that a dollar today is worth more than a dollar in the future due to its potential earning capacity. This concept is crucial for evaluating investment opportunities.
- **Present Worth (PW):** The present worth is the current value of a future cash flow, discounted at a specific interest rate. It helps in comparing different cash flows occurring at different times.
- **Future Worth (FW):** Future worth refers to the value of a current cash flow at a specified point in the future, considering the interest rate.
- **Annual Equivalent Worth (AEW):** AEW converts different cash flows into a uniform annual cash flow, allowing for easier comparison of projects.
- **Rate of Return (ROR):** This is a measure of the profitability of an investment, expressed as a percentage of the initial investment.

Common Engineering Economics Questions

Engineers often encounter various questions related to project evaluation and investment decisions. Below are some common engineering economics questions along with their solutions.

1. What is the Present Worth of a Future Cash Flow?

Question: You are expecting to receive $10,000 in five years. If the interest rate is 6%, what is the present worth of this cash flow?

Solution:
To find the present worth (PW), we can use the formula:

\[

$$
PW = \frac{FV}{(1 + i)^n}
$$

where:
- FV = Future Value ($10,000)
- i = Interest Rate (6% or 0.06)
- n = Number of Years (5)

Plugging in the values:

$$
PW = \frac{10,000}{(1 + 0.06)^5} = \frac{10,000}{1.338225} \approx 7,462.69
$$

Thus, the present worth of $10,000 in five years at a 6% interest rate is approximately $7,462.69.

2. How to Calculate the Future Worth of an Investment?

Question: If you invest $5,000 today at an interest rate of 8% for 10 years, what will be the future worth?

Solution:
To calculate the future worth (FW), we use the formula:

$$
FW = PV \times (1 + i)^n
$$

where:
- PV = Present Value ($5,000)
- i = Interest Rate (8% or 0.08)
- n = Number of Years (10)

Plugging in the values:

$$
FW = 5,000 \times (1 + 0.08)^{10} = 5,000 \times 2.158924 = 10,794.62
$$

Therefore, the future worth of a $5,000 investment at 8% over 10 years is approximately $10,794.62.

3. How to Determine the Annual Equivalent Worth of a Project?

Question: A project requires an initial investment of $20,000, and it is expected to generate cash flows of $5,000 annually for 5 years. If the interest rate is 7%, what is the annual equivalent worth?

Solution:
First, we calculate the present worth (PW) of the cash flows, and then we convert it to annual equivalent worth (AEW).

1. Calculate the present worth of cash flows:

Using the present worth of an annuity formula:

$$
PW = C \times \left(\frac{1 - (1 + i)^{-n}}{i}\right)
$$

where:
- C = Annual Cash Flow ($5,000)
- i = Interest Rate (7% or 0.07)
- n = Number of Years (5)

$$
PW = 5,000 \times \left(\frac{1 - (1 + 0.07)^{-5}}{0.07}\right) \approx 5,000 \times 4.1002 \approx 20,501
$$

2. Subtract the initial investment from the present worth:

$$
Net PW = PW - Initial Investment = 20,501 - 20,000 = 501
$$

3. Convert to Annual Equivalent Worth (AEW):

Using the formula:

$$
AEW = \frac{Net PW \times i}{1 - (1 + i)^{-n}}
$$

$$
AEW = \frac{501 \times 0.07}{1 - (1 + 0.07)^{-5}} \approx \frac{35.07}{0.325} \approx 108.70
$$

Thus, the annual equivalent worth of the project is approximately $108.70.

Conclusion

In conclusion, **engineering economics questions and solutions** are essential for professionals in the field to make sound financial decisions. Understanding key concepts such as the time value of money, present worth, future worth, annual equivalent worth, and rate of return can significantly impact the success of engineering projects. By mastering these concepts and practicing various questions, engineers can enhance their decision-making capabilities and contribute to more efficient resource allocation in their projects.

Frequently Asked Questions

What is the importance of time value of money in engineering economics?

The time value of money is crucial in engineering economics as it recognizes that a dollar today is worth more than a dollar in the future due to its potential earning capacity. This principle helps engineers and project managers evaluate investments, compare costs and benefits, and make informed financial decisions.

How do you calculate the Net Present Value (NPV) of a project?

The Net Present Value (NPV) is calculated by subtracting the initial investment from the present value of cash inflows, which are discounted at a specific rate over the project's life. The formula is $NPV = \Sigma (\text{Cash inflow} / (1 + r)^t) - \text{Initial Investment}$, where r is the discount rate and t is the time period.

What are the differences between fixed costs and variable costs in engineering projects?

Fixed costs remain constant regardless of production levels (e.g., rent, salaries), while variable costs fluctuate with production output (e.g., materials, labor). Understanding these costs helps engineers in budgeting and financial forecasting for projects.

What is the purpose of a break-even analysis in engineering economics?

Break-even analysis determines the point at which total revenues equal total costs, helping engineers understand the minimum output required to avoid losses. This analysis is essential for pricing strategies and evaluating the feasibility of engineering projects.

How can engineers assess the economic feasibility of a project?

Engineers can assess economic feasibility by conducting cost-benefit analyses, calculating payback periods, evaluating NPV and Internal Rate of Return (IRR), and considering qualitative factors such as market demand and potential risks.

What is the role of depreciation in engineering economic analysis?

Depreciation is important in engineering economic analysis as it allocates the cost of tangible assets over their useful life. It impacts cash flow, tax liabilities, and financial reporting, allowing engineers to make better investment and maintenance decisions.

What factors should be considered when selecting a discount rate for project evaluation?

When selecting a discount rate, factors to consider include the project's risk profile, the opportunity cost of capital, inflation rates, and the expected rate of return on similar investments. The chosen rate significantly affects the NPV and overall project assessment.

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