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Continuing Education Course #349
Engineering Economics Made Easier
with MS Excel

1. A Government agency has a headquarters in Baltimore, MD, and 1,400 field offices nationwide. It now has over 20 classrooms at its headquarters that it uses mostly for training the field office employees. It wants to build a "remote training broadcast center" in its headquarters to reduce the money now spent annually on travel to bring the field office employees to headquarters for training. It also wants to free up some floor space now used by the classrooms. The cost to design the broadcast center and install all necessary equipment at headquarters and at the field offices is:

- a. A residual value.
- b. An initial cost.
- c. An on-going cost.
- d. None of the above.

2. The reduction in annual travel costs by field office employees due to the implementation of the broadcast center in Question 1 is:

- a. An on-going cost.
- b. An on-going monetary benefit.
- c. An on-going intangible benefit.
- d. A one-time monetary benefit.

3. Which of the following is an incorrect statement about cash flow diagrams?

- a. Costs are usually depicted as downward arrows.
- b. Initial costs are shown in Year 0.
- c. Residual values are usually shown as savings in year "n".
- d. Future costs and benefits are usually shown in constant dollars.

4. The proposal measure that is calculated as the difference between benefits and costs is the:

- a. Benefit-cost ratio
- b. Net benefit
- c. ROI
- d. Payback period

5. The proposal measure(s) that calculate(s) "dollar efficiency" is:

- a. Net benefit.
- b. Benefit-cost ratio.
- c. ROI.
- d. Both b. and c.

6. Go to the worksheet named "Exam Q6 - Q7". Complete the calculations in the yellow cells. The net benefit of the proposal is:

- a. \$500,000.
- b. \$1,000,000.

- c. \$2,500,000.
- d. \$3,000,000.

7. Continue using the "Exam Q6 - Q7" worksheet. The ROI of the proposal is:

- a. (75%) meaning -75%.
- b. 1.25.
- c. 25%.
- d. 50%.

8. The possible implementation of the broadcast center in Question 1 is met with some resistance by field office personnel who believe remote training is not as good as the personal hands-on experience of a "live" instructor. This is an example of:

- a. A negative intangible benefit.
- b. An on-going cost.
- c. A negative monetary benefit.
- d. A positive intangible benefit.

9. The measure listed below that is the most impacted by incorrectly classifying a negative benefit as a cost is the:

- a. Net benefit.
- b. Net present value.
- c. Payback period.
- d. ROI.

10. The least reliable of the proposal measures listed below is the:

- a. Internal rate of return.
- b. Net present value.
- c. Net benefit.
- d. Payback period.

11. Go to the worksheet named "Exam Q11 – Q20". You create a "My Social Security" account on line, and you see that if you continue your current earnings level, and retire at age 62, you will draw \$1,062 per month, which is \$12,744 per year. Assuming you live until age 87, you will draw that annual benefit for 25 years. If you could earn 5% annual interest during retirement, what would be the equivalent present value amount of that annual benefit when you retire at age 62?

- a. \$3,763
- b. \$179,613
- c. \$298,791
- d. \$608,234

12. Continue using the "Exam Q11 – Q20" worksheet. An actuary determines that your Government pension will be worth \$1,200,000 when you retire at age 66. You are now age 36. Calculate its present value at a 4% annual interest rate. The present value is:

- a. \$90,153.
- b. \$292,402.
- c. \$369,982.
- d. \$731,437.

13. Continue using the "Exam Q11 – Q20" worksheet. A friend of yours spends \$10 a week playing the big lottery, or \$520 a year. If this money were invested in a stock mutual fund averaging a 10% annual return, how much would it grow to in 40 years?

- a. \$230,148
- b. \$277,621

- c. \$605,232
- d. \$2,301,481

14. Continue using the "Exam Q11 – Q20" worksheet. The American Resort Development Association estimates the average lump sum cost of a timeshare is \$22,000, plus a \$980 average annual maintenance fee. You are curious to find out if you delayed your plan to buy a timeshare, and instead you invested the costs of the timeshare into Treasury notes paying 3.75% in annual interest, how much money you would have after 10 years. Using $=FV$, the amount is:

- a. \$27,456.
- b. \$43,421.
- c. \$225,489.
- d. \$233,322.

15. Continue using the "Exam Q11 – Q20" worksheet. You do not believe there will be any Social Security when you retire, so you plan to start your own "social security program". You want to have \$3,000,000 saved when you retire in 35 years, and plan to diversify your investments and get an 8% annual rate of return. Using $=PMT$, how much must you contribute annually to achieve your goal?

- a. \$17,410
- b. \$49,618
- c. \$74,613
- d. \$85,714

16. Continue using the "Exam Q11 – Q20" worksheet. You find a great deal on a used Dodge Ram truck and you need to borrow only \$15,000. You gotta' have this truck! The annual interest rate is 4.21% for a 5-year loan. How much will your monthly payment be, P&I only?

- a. \$57
- b. \$236
- c. \$278
- d. \$282

17. Continue using the "Exam Q11 – Q20" worksheet. Using $=NPER$, how many years will it take for a \$1,000 purchase of Series I bonds to grow to \$2,000 at an interest rate of 2.83%?

- a. About 5 years
- b. About 15 years
- c. About 25 years
- d. About 35 years

18. Continue using the "Exam Q11 – Q20" worksheet. An engineer wins \$1,000,000 on a game show called "Engineer Survivor", where contestants survive by solving engineering problems on a remote tropical island. Unlike a previous winner from a different survivor show, she pays her taxes, and her winnings net to \$600,000, which she plans to invest at 7% interest. Buoyed by her success, she decides to retire early and live "frugally" on \$45,000 a year. Using $=NPER$, how many years will it take for her winnings to run out?

- a. About 10 years
- b. About 20 years
- c. About 30 years
- d. About 40 years

19. Continue using the "Exam Q11 – Q20" worksheet. An owner of a property was advised by a real estate agent to invest \$150,000 into an extensive remodel of her house. The agent believes that when the owner sells her house in 5 years, its market value will be \$200,000 more than it would have been without a remodel. Using $=RATE$, what would be the rate of return on this investment?

- a. About 6%
- b. About 7%

- c. About 8%
- d. About 10%

20. Continue using the "Exam Q11 – Q20" worksheet. A local printing company is considering purchasing a digital printer for \$100,000, which will have a life of 4 years. The owner hopes the printer will bring in additional revenues of \$50,000/year. Using =RATE, what would be the minimum attractive rate of return desired by the owner on this investment?

- a. 5%
- b. 15%
- c. 25%
- d. 35%

21. Present value analysis:

- a. Is defined as the present value costs less the present value benefits.
- b. Calculates an equivalent value of costs and benefits and "places" the values into year "n".
- c. Is defined as present value of all benefits less present value of all costs.
- d. Calculates an equivalent value of costs and benefits and "places" the values into year "0".

22. Go to the worksheet named "Exam Q22". For this ten-year proposal, there is an initial investment of \$100,000, and there are expected annual receipts of \$15,000 from years 1 through 10. Calculate the cash flows for each year, and then calculate the net present value using a 7% interest rate. Use =NPV. The net present value is:

- a. (\$9,764) meaning negative \$9,764.
- b. (\$9,125) meaning negative \$9,125.
- c. \$5,354.
- d. \$50,000.

23. Go to the worksheet named "Exam Q23". A star baseball player is offered \$300,000,000 in guaranteed money with his current team. Under the terms, he will get \$20,000,000 a year for the next 10 years, and then the remaining \$100,000,000 will be spread over a 25-year period (see the cash flows). Using =NPV, what is the present value of this offer if the interest rate is 5%?

- a. \$179,489,126
- b. \$188,463,582
- c. \$199,489,126
- d. \$300,000,000

24. According to OMB Circular A-94, constant-dollar benefit-cost analyses of proposed investments and regulations in which the public is directly impacted should report net present value using a real discount rate of:

- a. 0%.
- b. 3%.
- c. 7%.
- d. 10%.

25. According to OMB Circular A-94, for Federal Government proposals that involve lease-purchase agreements or that return only internal benefits to the Government and not to the public (such as a new heating system for a Federal building), the discount rate should be:

- a. 0%.
- b. 3%.
- c. 7%.
- d. Based on real Treasury borrowing rates on marketable securities of comparable maturity to the period of analysis.

26. The discount rate at which the present value of the benefits would equal the present value of the costs is:

- a. The internal rate of return.
- b. The net present value.
- c. The ROI.
- d. The payback period.

27. Go to the worksheet named "Exam Q27". A city is planning to build a 200-space parking garage for \$4,000,000. It will have a 30-year expected life. It plans to collect an average of \$5 per day per space, and average an 80% capacity. It therefore calculates that the annual revenue will be \$291,200. Using =IRR, what is the internal rate of return for this proposal?

- a. 6%
- b. 7%
- c. 8%
- d. 9%

28. Go to the worksheet named "Exam Q28". Back in 1967, a numismatist purchased many silver coins that were going out of circulation. He bought 1,000 ounces of silver when it was \$1.30 per ounce. He missed chances to sell his silver at very high prices, and instead sold his silver in 2019 for \$15.20 per ounce. What was the internal rate of return on this investment?

- a. Less than 1%
- b. About 2%
- c. About 3%
- d. About 5%

29. The maximum number of variables that can be displayed in *Excel's Data Table* is:

- a. One
- b. Two
- c. Three
- d. Four

30. A complete engineering economic analysis of a proposal would include:

- a. A calculation of the net present value of the proposal.
- b. An inclusion of a sensitivity analysis showing the effect that differing interest rates would have on the monetary attractiveness of the proposal.
- c. A description of the intangible (non-monetary) aspects of the proposal.
- d. All of the above.

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