Exam

Name_____

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Answer the question.

1) Minuteman Manufacturing is considering upgrading a piece of equipment. If a certain   1) _____
upgrade helps reduce operating costs by $80 per hour of use, and the upgraded equipment
will be used on average 7 hours per day, what is the expected annual savings of upgrading
the equipment over its remaining life of 8 years? What other factors do you need to take
into consideration to justify the decision to upgrade the equipment? Assume 360 working
days in a year.

Answer: $201,600

> Examples of other factors to be taken under consideration include the cost of the
> upgrade, the salvage value of the upgraded equipment, etc.

Explanation: Annual savings = reduced operating costs per hour x operating hours per day x
360 days

$$= 80 \times 7 \times 360$$
$$= 201,600$$

> Examples of other factors to be taken under consideration include the
> investment cost of the upgrade; the salvage value of the upgraded equipment;
> any impact on revenue (e.g., from improved service time, better flexibility to
> meet changing demand, and so on); other upgrade options and how they
> impact the costs and revenue; and other factors that impact the economics (e.g.,
> your required rate of return, your cost of funds, etc.).

2) You are given $7700 as a graduation gift and you are looking into two high interest   2) _____
investment options. The first option is a bond with a maturity date three years from now
that offers 12.25% per year interest, payable annually. The interest can be withdrawn only
at the end of year 3. Another option is a tax-free market savings account that offers 11.5%
per year interest, and the funds can be withdrawn any time after 2 years. Which is a better
alternative on the basis of total interest paid at the end of year 3? Discuss other factors, in
addition to interest rates, that should be taken into consideration to justify your investment
decision.

Answer: 1st option: Interest = $3190.55
2nd option: Interest = $2973.71
The 1st option is better on the basis of interest paid.

> Other factors that should be taken under consideration include whether the fund is
> left in the 2nd option at the end of year 2, the tax rate, other investment
> opportunities that the fund can be invested in after the end of year 2 that would
> yield higher return, etc.

Explanation: 1st option: Interest at the end of Year 1 = 7700 x 0.1225 = 943.25

Interest at the end of Year 2 = (7700 + 943.25) x (0.1225)

= 1058.80

Interest at the end of Year 3 = (7700 + 943.25 + 1058.80) x (0.1225)

= 1188.50

Total interest = 943.25 + 1058.80 + 1188.50

= 3190.55

2nd option: Interest at the end of Year 1 = 7700 x 0.115 = 885.50

Interest at the end of Year 2 = (7700 + 885.50) x (0.115)

= 987.33

Interest at the end of Year 3 = (7700 + 885.50 + 987.33) x (0.115)

= 1100.88

Total interest = 885.50 + 987.33 + 1100.88

= 2973.71

Thus, the 1st option is better on the basis of interest paid.

Other factors that should be taken under consideration include whether the fund is left in the 2nd option at the end of year 2, whether the fund can be reinvested at the same interest rate for the 2nd option, the tax rate, other investment opportunities that the fund can be invested in after the end of year 2 that would yield a higher return, and other factors that impact the economy which can impact the interest rate and price of the bond.

3) A company is considering two types of water heaters. The associated costs are shown below. The estimated annual cost of operation for oil heaters equals 365 x 41045/EF x Fuel Cost per Btu. The estimated annual cost of operation for electric heaters equals 365 x 12.03/EF x Electricity Cost per kWh. How much money could be saved each year if the company used an oil heater?

Alternative	Electricity	Oil
Price of water heater	$39,000	$36,000
EF	2.05	1.7
Fuel cost	$0.095/kWh	$0.0000064/Btu
Annual maintenance costs	$1000	$500

Answer: $647.08

Explanation: Estimated annual cost of operation for oil heaters

$$= 365 \text{ x } 41045/EF \text{ x Fuel Cost per Btu}$$
$$= 365 \text{ x } 41045/1.7 \text{ x } 0.0000064$$
$$= \$56.40$$

Annual cost of oil heater = $56.40 + 500
$$= 556.40$$

Estimated annual cost of operation for electric heaters
$$= 365 \text{ x } 12.03/EF \text{ x Electricity Cost per kWh}$$
$$= 365 \text{ x } 12.03/2.05 \text{ x } 0.095$$
$$= \$203.48$$

Annual cost of electric heater = $203.48+ 1000
$$= 1203.48$$

Annual saving = 1203.48 - 556.40
$$= 647.08$$

4) Tahiti Manufacturing recently purchased a new machine. The maintenance contractor recommended that this model should receive maintenance every 3,000-6,000 hours of operation. If each maintenance check costs $220 and the machine is expected to provide 30,000 hours of service, what is the total savings of scheduling maintenance every 6,000 hours over 3,000 hours?

Answer: $1100

Explanation: Maintenance every 3,000 hours:
Maintenance cost = 10 x $220 = 2200

Maintenance every 6,000 hours:
Maintenance cost = 5 x $220 = $1100

Total savings = 2200 - 1100 = 1100

5) Linda is considering using solar power for her new house. The solar panel that she is looking into contains four cells and can generate 80 milliwatts per square inch for 6 hours on an average day. Assume that all appliances she wants to power with solar electricity consume on average 900 watts per hour. The solar panel she is looking into costs around $73 per square feet plus additional costs of $600 for accessories and installation and will last for 6 years. Alternatively, she can purchase from the power grid at 44 cents per 100 watt-hours per day. Should Linda use the solar power system?

Answer: The solar panel costs = $23,412.50
       In the course of 6 years, the cost of electricity from the power grid = $208,137.60

       Linda should use the solar power system.

Explanation: Linda will need 900 watts x 24 hours = 21,600 watt-hours per day.

       A solar panel can generate 80 milliwatts per square inch x 6 hours = 480 milliwatt hours per square inch per day or 0.48 watt-hours per square inch per day.
       Therefore, Linda needs 45,000 square inches of solar panel for the house.
       Hence, the panel costs = $(73 x 45,000/144) + 600 = $23,412.50

       Alternatively, the electricity from the power grid cost = $(21,600/100) × (0.44) = $95.04 per day.

       In the course of 6 years, the cost of electricity from the power grid = $6 x 365 x $95.04 = $208,137.60.

       Linda should use the solar power system.

Answer Key
Testname: C1

1) $201,600
   Examples of other factors to be taken under consideration include the cost of the upgrade, the salvage value of the upgraded equipment, etc.

2) 1st option: Interest = $3190.55

   2nd option: Interest = $2973.71

   The 1st option is better on the basis of interest paid.

   Other factors that should be taken under consideration include whether the fund is left in the 2nd option at the end of year 2, the tax rate, other investment opportunities that the fund can be invested in after the end of year 2 that would yield higher return, etc.

3) $647.08

4) $1100

5) The solar panel costs = $23,412.50
   In the course of 6 years, the cost of electricity from the power grid = $208,137.60

   Linda should use the solar power system.