Exam File for Engineering Economic Analysis, 13th Edition
Newnan, Lavelle and Eschenbach

CHAPTER 2
ESTIMATING ENGINEERING COSTS AND BENEFITS

Data for problems 2-1 to 2-4

Tech Engineering in TN is making a product for the overseas market.
The following cost data for the product has been compiled.

Item	Cost
Selling price	$167
Materials and purchased parts	$25/unit
Direct Labor	2 hrs at $20 per hour
Fixed Cost	$1,400,000

Problem 2-1

If the overhead expenses are charged at 80 % of labor cost, determine the manufacturing cost per unit.

A. $72 B. $97 C. $65 D. None of these

Solution:

Total manufacturing cost = Materials cost + Direct labor cost + overhead cost
= $25 + 2×20 + 0.80×2×20 = $97

The answer is "B".

Problem 2-2

The breakeven volume for this product is _____.

A. 14,433 B. 8,383 C. 20,000 D. None of these

Solution:

Total revenue = Total cost = Fixed cost + variable cost
167X = 1,400,000 + 97X
X = 1,400,000 /(167-97) = 20,000 Units.
The answer is "C".

Problem 2-3

What is the profit per unit if 30,000 units are sold?

A. $23.33 B. $20.81 C. $24.35 D. None of these

Solution:

Total profit = Total revenue - Total cost

= 30,000 × 167 – (1,400,000+ 97×30,000) = $700,000
Profit per unit = 700,000/30,000 = $23.33
The answer is "A".

Problem 2-4
To reduce the breakeven volume to 15,000 units, what should be the selling price ?
A. $210.33 B. $190.33 C. $241.35 D. None of these

Solution:
Total revenue = Total cost = Fixed cost + variable cost
Y × 15,000 = 1,400,000 + 97 × 15,000
Y = (1,400,000 + 97×15,000) /15,000 = $190.33
The answer is "B".

Problem 2-5
A 2000-gallon metal tank to store hazardous materials was bought 15 years ago at cost of $100,000. What will a 5,000-gallon tank cost today if the power–sizing exponent is 0.57 and the construction cost index for such facilities has increased from 180 to 600 over the last 15 years? Choose the closest value.
A. $337,175 B. $666,667 C. $561,960 D. None of these_____

Solution:
Cost of a 5000-gallon tank without cost index = 100,000 $(5,000/2,000)^{0.57}$ = $168,588
Cost of a 5000-gallon tank today with the cost index = (600/180)168,588 = $561,960
The answer is "C".

Data for problems 2-6 to 2-8

A product that is very labor intensive assembled at Boyds Aero Structure in Memphis has an average labor cost of $20/hr. Overhead expenses are charged at 100% of labor at this company.
Time for the very first unit = 10 hours
Time for the fourth unit = 8.1 hours.

Problem 2-6

The learning curve percentage for this operation is _____.
A. 90% B. 85% C. 95% D. 75%

Solution:

$$y_4 = 10(4)^n$$

$$8.1 = 10(4)^n$$

$$4^n = \frac{8.1}{10} = .81$$

n = -.0.1521

learning curve % = 90%

The answer is “A”.

Problem 2-7

What is the cumulative time for 100 units to be made?

A. 869.12 hrs B. 581.33 hrs C. 761.84 hrs D. 621.68 hrs

Solution:

Time for the first unit = 10 hrs

Cumulative time for 100 units = $\{10 \times [(100+0.5)^{(1-0.1521}$ - $(0.5)^{(1-0.1521}]/ (1-0.1521)\}$

= 581.33 hrs.

The answer is “B”.

Problem 2-8

What is the labor cost and overhead cost for the 500–th unit?

A. $162.30 B. $155.44 C. $139.88 D. $175.23

Solution:

Time for the 500 units = $10\ (500)^{-0.1521}$ = 3.8858 hrs

Labor cost for the 500-th unit = 3.8858 (20) = $77.72

Labor and overhead costs = $77.72+77.72 = $155.44.88

The answer is “B”.

True or False Problems

Problem 2-9

The learning curve percentage is 80% if the learning curve exponent is given as -0.3214.

True/False

Solution:

-0.3214 = log (learning curve expressed as a decimal) / log 2.0

Learning curve expressed as a decimal = 10^((log 2.0) * (-0.3214)) =0.80 or 80%

The answer is **“True”.**

Problem 2-10

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The breakeven volume is the quantity for which the unit cost is minimized.
True/False

Solution:
The breakeven volume is the quantity for which the total revenue is exactly equal to the total cost, both fixed cost plus variable cost.
The answer is **"False".**

Problem 2-11
Sunk costs must be ignored in engineering economic decision making as sunk costs are money already spent and do not have any consequence on decision making.
True/False

Solution:
The answer is **"True"** as costs incurred in the past do not make a difference.

Problem 2-12
An opportunity cost is associated with using a resource in one activity instead of another.
True/False

Solution:
It is **"True"** as the amount of resources used in one activity cannot be used in another activity.

Problem 2-13
Life cycle costs (LCC) are costs incurred on a product from cradle to grave, (i.e) concept generation to retirement.
True/False

Solution:
The answer is **"True".** The cost increased from concept generation to retirement of a product is life cycle cost.