Engineering Economy 17th edition Sullivan Test Bank

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

Answer the question.

1) A $38,000 coil winding and unwinding machine is estimated to provide additional value to production by $15 per unit. When the machine is operated at 58 units per hour, it needs to be cooled down after 4 hours of operation and receive minor maintenance for 15 minutes. When the machine is operated at 118 units per hour, it needs to be cooled down after 5 hours of operation and receive minor maintenance for 30 minutes. The production line runs 8 hours per day. If each maintenance check costs $625 and the machine has a useful life of 80,000 hours of operations, at what speed should the machine should be operated?

Answer: At 58 units per hour, net increase in value per day = $5363.83

At 118 units per hour, net increase in value per day = $11,922.81

Select the machine speed that provides the higher net increase in value per day—machine speed B.

2) You are deciding between three types of water heaters. The associated costs are shown below. The annual cost of operation for gas and oil heaters is estimated by 365 x 41045/EF x Fuel Cost per Btu, and the annual cost of operation for electric water heaters is estimated by 365 x 12.03/EF x Electricity Cost per kWh. The selected heater will be used for only one year and then sold at the market value. Which alternative should be selected?

Alternative	Electric	Gas	Oil
Price of water heater	$28,000	$23,000	$25,000
EF	2.0	0.57	0.75
Fuel cost	$0.1/kWh	$0.00001/Btu	$0.00001/Btu
Annual maintenance costs	$3000	$2200	$2500
Market value	$25,200	$20,700	$22,500

Answer: Total cost of electric heater = $6019.55
Total cost of gas heater = $4762.83
Total cost of oil heater = $5199.75

Select the heater that provides the least annual costs—the gas heater.

3) A garment manufacturing company makes 380,000 articles per year. Each article takes 95 minutes of direct labor at the rate of $9.00 per hour. The overhead costs are $7.50 per direct labor hour. The average price of the finished product is $80 per article. A new machine will reduce the direct labor hour by 15 minutes per article. What is the maximum amount the company should pay for the new machine if it wants to break even by the end of the first year?

Answer: $1,567,500.00

4) A local cable company has a fixed cost of $7400 per month and variable costs of $50 per month per subscriber. If the company charges on average $110 per month to its customers, find the breakeven point in terms of subscribers per month for the company.

Answer: 123.33 subscribers per month

5) A company estimates its annual expenses, Y, in dollars from $Y = 0.235X^2 + 7X + 4$ and annual revenue in dollars from $0.215X^2 + 15X$, where X is annual units sold. Find the value of X that gives maximum profit.

Answer: 200 units

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6) The annual fixed cost for an inspecting and profiling web controller manufacturing company are $44,000, and the variable costs are $38 per unit. If the selling price per unit is p = 495 – 0.57X, what is the company's range of profitable demand?

Answer: The range of profitable demand is 112 to 689 units per year.

7) The annual fixed cost for a light fixture manufacturing company are $38,000, and the variable costs are $40 per unit. If the selling price per unit is p = 485 – 1.395X, what is the optimum demand for a light fixture?

Answer: 159.50 units per year

8) An accounting and management consulting firm charge–out rate is $112 per hour. The maximum output is 214,000 hours per year. The fixed cost is $610,000 per year and the variable cost is $62 per standard service hour. What is the breakeven point in percentage of total capacity?

Answer: 5.70% of capacity

9) A headhunter company has fixed costs of $57,000 per month and variable costs of $1000 per customer account. The company currently charges $1150 per month for each account and has 38,000 accounts. It wants to raise the monthly fee to $1160.55 to cover enhanced features such as a new web interface and a newly acquired database, which increases the variable cost by 9 percent. What is the new breakeven point in number of accounts?

Answer: 807.94 accounts

10) The cost for operating a commercial truck is $knv^{1/2}$, where k is a constant of proportionally, v is velocity in miles per hours, and n is the trip length in miles. It is estimated that at 85 mph, the average cost of operation is $52 per mile. The truck owner wants to minimize the cost of operation, which needs to balance against the cost of delays and unscheduled maintenance, which is assumed to be $10 per hour. What is the optimum velocity needed to minimize the total costs?

Answer: The truck should be operated at an average velocity of 2.33 mph to minimize the total cost of operation and delays.

11) A manufacturing company leases a machine for $31,000 per year. Each unit produced costs $36 in labor and $65 in materials. To break even, 21,000 units must be sold. What is the price of the product?

Answer: $102.48

12) A manufacturing plant is planning to replace outdated equipment with more energy–efficient and environmental–friendly equipment. Two models are under consideration. Model A is sold for $159,000 and can produce at an optimum speed of 78 unit/hour. Model B is sold for the same price, but can produce at an optimum speed of 76 unit/hour. Model A requires 6 hours of maintenance for every 4300 units produced, while Model B requires 5 hours of maintenance for every 3300 units. The maintenance cost for both models is $100 per hour. The variable operating cost is $340 per hour for Model A and $290 per hour for Model B. Due to obsolete parts, there is a sunk cost of $2700 for model A and $1900 for Model B . If the price of the product is $150 per unit and the company expects to sell 145,000 units each year, which model should be selected?

Answer: Model A: $652,284 per 145,000 units
Model B: $575,259 per 145,000 units
Select the design that minimizes the total cost for 145,000 units/year—Model B.

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13) A manufacturer of hard board and fiber cement sidings and panels purchased new equipment for its new product line. Three alternatives are under consideration. The costs associated with each alternative are given below. Which alternative is most economical to minimize total life cycle costs, if the life of the equipment is estimated to be 7 years and the company operates on average 3800 hours per year? Assume negligible salvage value.

Alternative	A	B	C
Investment cost, $	40,000	39,000	41,000
Fixed cost, $/year	4700	4500	4800
Variable cost, $/hour	240	235	243

Answer: A: Total life cycle costs = $6,456,900.00
B: Total life cycle costs = $6,321,500.00
C: Total life cycle costs = $6,538,400.00

To minimize life cycle costs, select Alternative B.

14) A night vision goggle manufacturer is evaluating a make–versus–purchase situation for a component used in its low–priced products. The component can be purchased at a variable wholesale price of P = 1200 + 50X, where X is the number of items. Alternatively, the component can be produced with a direct material cost of $17 per item and direct labor cost of $38 per item. The manufacturing overhead is allocated at 150% of direct labor cost per item. If the company requires, on average, 575 items each year, should the item be purchased or manufactured?

Answer: Purchase: $29,950.00

Manufacture: $64,400.00

Select the option that has the least total cost—purchasing the item.

15) An uninterruptible power system manufacturer is currently deciding between two processes for its new automated assembly system. All defect–free units can be sold at $210 each, and all rejected units can be sold at $11 for scrap. Other related information for each model is given below.

Process	A	B
Output rate, units/hour	250	230
Daily available production time, hours	14	16
Material cost, $/unit	25	25
Variable operating cost, $/hour	45	49
Variable overhead cost, $/hour	40	39
Percent reject	40	38

Which process should be adopted to maximize profit per day?

Answer: Process A : Profit per day = $367,710.00

Process B : Profit per day = $401,110.40

Select the process that maximizes profit per day—Process B.

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4) 123.33 subscribers per month
5) 200 units
6) The range of profitable demand is 112 to 689 units per year.
7) 159.50 units per year
8) 5.70% of capacity
9) 807.94 accounts
10) The truck should be operated at an average velocity of 2.33 mph to minimize the total cost of operation and delays.
11) $102.48
12) Model A: $652,284 per 145,000 units
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    B: Total life cycle costs = $6,321,500.00
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