**Chapter 17: Sales and Operations Planning**

**Practice Problems**

**MULTIPLE CHOICE**

Deforrest Marine Motors manufactures engines for the speedboat racing circuit. As part of their annual planning cycle, they forecasted demand for the next four quarters. The number of available days of production and the anticipated demand are given below.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Q1 | Q2 | Q3 | Q4 |
| Days of Production | 65 | 68 | 61 | 64 |
| Demand | 1800 | 2200 | 1700 | 2400 |

They also estimated many of the costs required to conduct operations planning. Some of these key figures are listed below.

|  |  |  |  |
| --- | --- | --- | --- |
| Employees | 30 | Hire Cost | $1,200/employee |
| Production Rate | 1 unit/employee/day | Fire Cost | $800/employee |
| Production Cost | $1,000/unit | Subcontracting Cost | $1,800/unit |
| Backorder Cost | $200 | Subcontracting Limit | 400 units maximum |
| Overtime Cost | $1,500 | Inventory Cost | $100/unit/quarter |
| Overtime Limit | <= 25% of Reg. Production | Initial Inventory | 280 units |

1. Given the assumption that Deforrest Marine Motors will maintain the same number of employees (30 employees) for the entire year, what would be the production for the first quarter?

|  |  |
| --- | --- |
| a. | 1,520 |
| b. | 1,800 |
| c. | 1,950 |
| d. | 2,100 |

ANS: C PTS: 1 DIF: Easy

2. Given the assumption that Deforrest Marine Motors will maintain the same number of employees (30 employees) for the entire year, what would be the production for the second quarter?

|  |  |
| --- | --- |
| a. | 1,960 |
| b. | 2,040 |
| c. | 2,160 |
| d. | 2,200 |

ANS: B PTS: 1 DIF: Easy

3. Given the assumption that Deforrest Marine Motors will maintain the same number of employees (30 employees) for the entire year, what would be the production for the third quarter?

|  |  |
| --- | --- |
| a. | 1,420 |
| b. | 1,690 |
| c. | 1,740 |
| d. | 1,830 |

ANS: D PTS: 1 DIF: Easy

4. Given the assumption that Deforrest Marine Motors will maintain the same number of employees (30 employees) for the entire year, what would be the production for the fourth quarter?

|  |  |
| --- | --- |
| a. | 1,860 |
| b. | 1,920 |
| c. | 2,210 |
| d. | 2,400 |

ANS: B PTS: 1 DIF: Easy

5. Given that the beginning inventory (start of Q1) was 280 units, what would be the average on-hand inventory for the first quarter?

|  |  |
| --- | --- |
| a. | 335 |
| b. | 355 |
| c. | 370 |
| d. | 450 |

ANS: B PTS: 1 DIF: Medium

6. What would be the average on-hand inventory for the second quarter?

|  |  |
| --- | --- |
| a. | 350 |
| b. | 360 |
| c. | 375 |
| d. | 400 |

ANS: A PTS: 1 DIF: Medium

7. What would be the average on-hand inventory for the third quarter?

|  |  |
| --- | --- |
| a. | 335 |
| b. | 355 |
| c. | 370 |
| d. | 400 |

ANS: A PTS: 1 DIF: Medium

8. What would be the average on-hand inventory for the fourth quarter?

|  |  |
| --- | --- |
| a. | 160 |
| b. | 200 |
| c. | 225 |
| d. | 255 |

ANS: A PTS: 1 DIF: Medium

9. What would be the total on-hand average inventory holding cost for the four quarters?

|  |  |
| --- | --- |
| a. | $88,000 |
| b. | $92,000 |
| c. | $120,000 |
| d. | $156,000 |

ANS: C PTS: 1 DIF: Hard

10. What was the total cost of producing products across the four quarters?

|  |  |
| --- | --- |
| a. | $6,890,000 |
| b. | $7,070,000 |
| c. | $7,289,000 |
| d. | $7,740,000 |

ANS: D PTS: 1 DIF: Medium

11. What was the total cost of backordering across the four quarters?

|  |  |
| --- | --- |
| a. | $0 |
| b. | $9,000 |
| c. | $16,000 |
| d. | $24,000 |

ANS: C PTS: 1 DIF: Medium

12. What was the total cost for this plan?

|  |  |
| --- | --- |
| a. | $6,940,000 |
| b. | $7,465,000 |
| c. | $7,756,000 |
| d. | $8,348,000 |

ANS: C PTS: 1 DIF: Medium

Deforrest Marine Motors wishes to examine a chase strategy—an operations strategy where they hire and fire employees to match demand. They plan on using a policy where if the need were for 21.2 workers, they would hire 22 workers for that quarter.

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|  |  |  |  |  |
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|  | Q1 | Q2 | Q3 | Q4 |
| Days of Production | 65 | 68 | 61 | 64 |
| Demand | 1800 | 2200 | 1700 | 2400 |

They also estimated many of the costs required to conduct operations planning. Some of these key figures are listed below.

|  |  |  |  |
| --- | --- | --- | --- |
| Employees | 30 | Hire Cost | $1,200/employee |
| Production Rate | 1 unit/employee/day | Fire Cost | $800/employee |
| Production Cost | $1,000/unit | Subcontracting Cost | $1,800/unit |
| Backorder Cost | $200 | Subcontracting Limit | 400 units maximum |
| Overtime Cost | $1,500 | Inventory Cost | $100/unit/quarter |
| Overtime Limit | <= 25% of Reg. Production | Initial Inventory | 280 units |

13. How many workers would Deforrest Marine Motors need for the first quarter?

|  |  |
| --- | --- |
| a. | 22 |
| b. | 24 |
| c. | 26 |
| d. | 28 |

ANS: B PTS: 1 DIF: Easy

14. How many workers would Deforrest Marine Motors need for the second quarter?

|  |  |
| --- | --- |
| a. | 30 |
| b. | 31 |
| c. | 33 |
| d. | 35 |

ANS: C PTS: 1 DIF: Easy

15. How many workers would Deforrest Marine Motors need for the third quarter?

|  |  |
| --- | --- |
| a. | 28 |
| b. | 30 |
| c. | 31 |
| d. | 34 |

ANS: A PTS: 1 DIF: Easy

16. How many workers would Deforrest Marine Motors need for the fourth quarter?

|  |  |
| --- | --- |
| a. | 28 |
| b. | 33 |
| c. | 36 |
| d. | 38 |

ANS: D PTS: 1 DIF: Easy

17. What would be the total hire and fire cost for this plan across the four quarters?

|  |  |
| --- | --- |
| a. | $0 |
| b. | $16,400 |
| c. | $24,400 |
| d. | $29,600 |

ANS: D PTS: 1 DIF: Hard

18. What was the total cost of producing products across the four quarters?

|  |  |
| --- | --- |
| a. | $7,876,000 |
| b. | $8,010,000 |
| c. | $8,204,000 |
| d. | $8,560,000 |

ANS: A PTS: 1 DIF: Medium

19. What was the total cost of backordering across the four quarters?

|  |  |
| --- | --- |
| a. | $0 |
| b. | $12,600 |
| c. | $20,800 |
| d. | $28,700 |

ANS: A PTS: 1 DIF: Medium

20. What would be the total on-hand average inventory holding cost for the four quarters?

|  |  |
| --- | --- |
| a. | $33,200 |
| b. | $36,200 |
| c. | $37,600 |
| d. | $40,000 |

ANS: D PTS: 1 DIF: Medium

21. What was the total cost for this plan?

|  |  |
| --- | --- |
| a. | $7,762,400 |
| b. | $7,945,600 |
| c. | $8,989,000 |
| d. | $9,145,000 |

ANS: B PTS: 1 DIF: Hard

Deforrest Marine Motors manufactures engines for the speedboat racing circuit. As part of their annual planning cycle, they forecasted demand for the next four quarters. The number of available days of production and the anticipated demand are given below.

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| Production Cost | $1,000/unit | Subcontracting Cost | $1,800/unit |
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| Overtime Cost | $1,500 | Inventory Cost | $100/unit/quarter |
| Overtime Limit | <= 25% of Reg. Production | Initial Inventory | 280 units |

Deforrest Marine Motors wishes to examine a mixed strategy. They reduced their workforce to 25 employees. If the regular production and the inventory is unable to meet demand, they will employ (in that quarter) the maximum amount of overtime. Should that be insufficient, the firm will use subcontracting up to the point of exactly meeting demand.

22. What would be the regular-time production level for the first quarter?

|  |  |
| --- | --- |
| a. | 1,575 |
| b. | 1,625 |
| c. | 1,675 |
| d. | 1,725 |

ANS: B PTS: 1 DIF: Easy

23. What would be the regular-time production level for the second quarter?

|  |  |
| --- | --- |
| a. | 1,700 |
| b. | 1,860 |
| c. | 1,960 |
| d. | 2,200 |

ANS: A PTS: 1 DIF: Easy

24. What would be the regular-time production level for the third quarter?

|  |  |
| --- | --- |
| a. | 1,430 |
| b. | 1,500 |
| c. | 1,525 |
| d. | 1,600 |

ANS: C PTS: 1 DIF: Easy

25. What would be the regular-time production level for the fourth quarter?

|  |  |
| --- | --- |
| a. | 1,430 |
| b. | 1,500 |
| c. | 1,525 |
| d. | 1,600 |

ANS: D PTS: 1 DIF: Easy

26. What would be the required overtime production, if any, in the first quarter?

|  |  |
| --- | --- |
| a. | 0 |
| b. | 145 |
| c. | 175 |
| d. | 260 |

ANS: A PTS: 1 DIF: Medium

27. What would be the required overtime production, if any, in the second quarter?

|  |  |
| --- | --- |
| a. | 350 |
| b. | 380 |
| c. | 425 |
| d. | 440 |

ANS: C PTS: 1 DIF: Medium

28. What would be the required overtime production, if any, in the third quarter?

|  |  |
| --- | --- |
| a. | 290 |
| b. | 381 |
| c. | 420 |
| d. | 440 |

ANS: B PTS: 1 DIF: Medium

29. What would be the required overtime production, if any, in the fourth quarter?

|  |  |
| --- | --- |
| a. | 175 |
| b. | 225 |
| c. | 325 |
| d. | 400 |

ANS: D PTS: 1 DIF: Medium

30. Given that the beginning inventory (start of Q1) was 280 units, what would be the average on-hand inventory (round up if necessary) for the first quarter?

|  |  |
| --- | --- |
| a. | 0 |
| b. | 143 |
| c. | 280 |
| d. | 300 |

ANS: B PTS: 1 DIF: Medium

31. What would be the average on-hand inventory (round up if necessary) for the second quarter?

|  |  |
| --- | --- |
| a. | 68 |
| b. | 90 |
| c. | 120 |
| d. | 143 |

ANS: A PTS: 1 DIF: Medium

32. What would be the average on-hand inventory (round up if necessary) for the third quarter?

|  |  |
| --- | --- |
| a. | 55 |
| b. | 88 |
| c. | 134 |
| d. | 202 |

ANS: C PTS: 1 DIF: Medium

33. What would be the average on-hand inventory (round up if necessary) for the fourth quarter?

|  |  |
| --- | --- |
| a. | 0 |
| b. | 118 |
| c. | 165 |
| d. | 183 |

ANS: B PTS: 1 DIF: Medium

34. What would be the total cost for regular-time production across the four quarters?

|  |  |
| --- | --- |
| a. | $3,230,000 |
| b. | $4,400,000 |
| c. | $6,450,000 |
| d. | $7,990,000 |

ANS: C PTS: 1 DIF: Easy

35. What would be the total cost for overtime production across the four quarters?

|  |  |
| --- | --- |
| a. | $235,600 |
| b. | $398,100 |
| c. | $712,300 |
| d. | $1,809,375 |

ANS: D PTS: 1 DIF: Hard

36. What would be the total on-hand average inventory holding cost for the four quarters?

|  |  |
| --- | --- |
| a. | $51,300 |
| b. | $178,100 |
| c. | $234,800 |
| d. | $401,600 |

ANS: A PTS: 1 DIF: Medium

37. What would be the total subcontracting cost, if any, for the four quarters?

|  |  |
| --- | --- |
| a. | $102,800 |
| b. | $182,000 |
| c. | $295,200 |
| d. | $456,000 |

ANS: C PTS: 1 DIF: Hard

38. What was the total cost for this plan?

|  |  |
| --- | --- |
| a. | $8,302,500 |
| b. | $8,605,875 |
| c. | $8,903.400 |
| d. | $9,102,700 |

ANS: B PTS: 1 DIF: Medium

Xebex Technologies Corporation (XTC) manufactures a number of navigation packages for pleasure boats. Their plant in Alabama wants to try a fixed production schedule for the next 6 months. When regular-time production and inventory cannot meet demand, they plan on first using overtime, and if that is insufficient, they will subcontract out in order to meet demand. The forecast for the next 6 months and key production data are provided below.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Jan | Feb | Mar | Apr | May | Jun |
| Demand | 700 | 600 | 400 | 650 | 850 | 1000 |

|  |  |  |  |
| --- | --- | --- | --- |
| Production Rate | 650 units/month | Fire Cost | $800/employee |
| Production Cost | $100/units | Subcontracting Cost | $200/unit |
| Backorder Cost | $175/unit | Subcontracting Limit | 200 units maximum |
| Overtime Cost | $150/unit | Average Inventory Cost | $20/unit/month |
| Overtime Limit | 100 units | Initial Inventory | 100 units |

39. Given the fixed production rate of 650 units per month and an initial inventory level of 100 units, what would be the average on-hand inventory for January?

|  |  |
| --- | --- |
| a. | 55 |
| b. | 75 |
| c. | 100 |
| d. | 150 |

ANS: B PTS: 1 DIF: Easy

40. What would be the average on-hand inventory for March?

|  |  |
| --- | --- |
| a. | 75 |
| b. | 150 |
| c. | 175 |
| d. | 225 |

ANS: D PTS: 1 DIF: Easy

41. What would be the total inventory holding cost for the 6 months?

|  |  |
| --- | --- |
| a. | $0 |
| b. | $21,000 |
| c. | $105,000 |
| d. | $205,000 |

ANS: B PTS: 1 DIF: Medium

42. What would be the regular-time production cost for the 6 months?

|  |  |
| --- | --- |
| a. | $120,000 |
| b. | $390,000 |
| c. | $650,000 |
| d. | $780,000 |

ANS: B PTS: 1 DIF: Easy

43. What months, if any, did XTC require the use of overtime production?

|  |  |
| --- | --- |
| a. | January |
| b. | March, April, and June |
| c. | May and June |
| d. | June |

ANS: D PTS: 1 DIF: Medium

44. What months, if any, did XTC require the use of subcontracting production?

|  |  |
| --- | --- |
| a. | January |
| b. | March, April, and June |
| c. | May and June |
| d. | June |

ANS: D PTS: 1 DIF: Medium

45. What would be the overtime time production cost, if any, for the 6 months?

|  |  |
| --- | --- |
| a. | $0 |
| b. | $10,000 |
| c. | $15,000 |
| d. | $25,000 |

ANS: C PTS: 1 DIF: Medium

46. What would be the subcontracting cost, if any, for the 6 months?

|  |  |
| --- | --- |
| a. | $0 |
| b. | $10,000 |
| c. | $15,000 |
| d. | $20,000 |

ANS: D PTS: 1 DIF: Medium

47. As an alternative to a fixed production schedule, Xebex Technologies Corporation (XTC) considers an operations plan where they fluctuate the number of employees. Presently, XTC has 25 employees, and each employee can produce 25 units per month. The cost of laying off an employee is $800 per employee, and the cost of hiring an employee is $1,000 per employee. What would be the hiring cost for this program?

|  |  |
| --- | --- |
| a. | $0 |
| b. | $15,000 |
| c. | $20,000 |
| d. | $24,000 |

ANS: D PTS: 1 DIF: Medium

48. What would be the total layoff cost for this program?

|  |  |
| --- | --- |
| a. | $0 |
| b. | $1,800 |
| c. | $7,200 |
| d. | $9,600 |

ANS: C PTS: 1 DIF: Medium

49. What would be the total cost of subcontracting?

|  |  |
| --- | --- |
| a. | $0 |
| b. | $1,200 |
| c. | $3,000 |
| d. | $3,600 |

ANS: A PTS: 1 DIF: Easy

50. What would be the total cost of this program (fluctuating personnel)?

|  |  |
| --- | --- |
| a. | $402,500 |
| b. | $442,200 |
| c. | $601,800 |
| d. | $728,000 |

ANS: B PTS: 1 DIF: Hard