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SCM 301 (Solo) – Exam 3 – Practice Exam Solutions

1. **D –** Product-based layout

2. **C –** Constant competition

3. **D –** All of the above

4. **D –** Engineer-to-order (ETO) product

5. **D –** Value perspective

6. **A –** The information they receive is more distorted than companies located downstream

7. **E –** Only A and B

8. **A –** Make-to-stock (MTS) product

9. **D –** All of the above

10. **A –** 0.32

    The mean of 198 is centered in the LTL and the UTL. We know that the mean is centered because the UTL of 211 plus the LT of 198 divided by 2 is equal to the mean of 198. Since the mean is centered, we can use the process capability ratio.

$$C_p = \frac{UTL - LTL}{6\sigma}$$

$$\frac{211-185}{6*(13.5)} = \frac{26}{81} = 0.32$$

11. **B –** Less than or equal to 2.17 pounds

$$C_p = \frac{UTL - LTL}{6\sigma} \geq 2 \quad \longrightarrow \quad UTL - LTL \geq 12\sigma$$

211 – 185 ≥ 12(σ)

26 ≥ 12(σ)

$\sigma \leq \frac{26}{12}$

$\sigma \leq 2.167 = 2.17$

12. **C –** 70,000 ounces

Since demand is constant and there is no variability in lead time, we can use the following formula to calculate the reorder point (ROP):

$$\boldsymbol{ROP\ (with\ certianty) = d \times L}$$

= (10,000)*(7) = 70,000 ounces

13. **D –** Job shop

14. **C –** Fixed-position layout

15. **A –** Conformance perspective

16. **D –** Total quality management (TQM)

17. **D –** Anticipation stock

18. **A –** More distorted the information is that they receive

19. **E –** Production line

20. **B –** Conformance

21. **D –** Flexible manufacturing system (FMS)

22. **A –** Internal failure costs

23. **A –** Attributes

24. **B –** Batch manufacturing

25. **A –** 253

$$\boldsymbol{Economic\ Order\ Quantity\ (EOQ)} = \sqrt{\frac{\boldsymbol{2SD}}{\boldsymbol{H}}}$$

$$= \sqrt{\frac{(2)(\$400)(2{,}400)}{\$30}} = \sqrt{64{,}000} = 252.98 = 253$$

26. **A –** 127

$$\boldsymbol{Average\ Inventory} = \left(\frac{\boldsymbol{Q}}{\boldsymbol{2}}\right) = \left(\frac{253}{2}\right) = 126.5 = 127$$

27. **A –** 10

$$\boldsymbol{Avg\ \#\ orders\ per\ yr} = \frac{\boldsymbol{D}}{\boldsymbol{Q}} = \frac{2{,}400}{253} = 9.486 = 9.49 = 10$$

28. **A –** $3,794.47

$$\boldsymbol{Total\ Ordering\ Cost\ (TOC)} = \boldsymbol{S} \times \left(\frac{\boldsymbol{D}}{\boldsymbol{Q}}\right) = \$400 \times \left(\frac{2{,}400}{253}\right) = \$3{,}794.47$$

29. **B –** $3,795

$$\boldsymbol{Total\ Holding\ Cost\ (THC)} = \boldsymbol{H} \times \left(\frac{\boldsymbol{Q}}{\boldsymbol{2}}\right) = \$30 \times \left(\frac{253}{2}\right) = \$3{,}795$$

30. **C –** $7,589.47

$$\boldsymbol{Total\ Annual\ Inventory\ (TAC)Cost} = \boldsymbol{H}\left(\frac{\boldsymbol{Q}}{\boldsymbol{2}}\right) + \boldsymbol{S}\left(\frac{\boldsymbol{D}}{\boldsymbol{Q}}\right)$$

= $3,795 + $3,794.47 = $7,589.47

31. **C –** Make-to-order (MTO) product

32. **B –** Cost

33. **D –** Reliability

34. **A –** 72,074

$$ROP = \overline{dL} + z\sqrt{\overline{L}\sigma_d^2 + \overline{d}^2\sigma_L^2}$$

$(10{,}000)(7) + 1.65\sqrt{(7)(475)^2 + (10{,}000)^2(0)^0}$
$70{,}000 + 1.65\sqrt{1{,}579{,}375}$
$70{,}000 + 1.65(1{,}256.73)$
$70{,}000 + 2{,}073.61 = 72{,}073.61 = 72{,}074$

35. **C –** 103,066

$$ROP = \overline{dL} + z\sqrt{\overline{L}\sigma_d^2 + \overline{d}^2\sigma_L^2}$$

$(10{,}000)(7) + 1.65\sqrt{(7)(475)^2 + (10{,}000)^2(2)^2}$
$70{,}000 + 1.65\sqrt{401{,}579{,}375}$
$70{,}000 + 1.65(20{,}039.45)$
$70{,}000 + (33{,}065.08) = 103{,}065.09 = 103{,}066$

36. **D –** Activities that take place after the point of customization are called upstream activities

    These are downstream activities, not upstream activities.

37. **D –** All of the above

38. **C –** Serviceability

39. **C –** Consumer's risk

40. **A –** 0.50

$$C_{pk} = \min\left[\frac{\mu - LTL}{3\sigma}, \frac{UTL - \mu}{3\sigma}\right]$$

LTL = 20 – 0.9 = 19.1
UTL = 20 + 0.9 = 20.9

$$= min\left\lceil\frac{20.3 - 19.1}{3 * (0.4)}\right\rceil, \left\lceil\frac{20.9 - 20.3}{3 * (0.4)}\right\rceil$$

$$= min\left\lceil\frac{1.2}{1.2}\right\rceil, \left\lceil\frac{0.6}{1.2}\right\rceil$$

$$= \ min\lceil 1\ , 0.5\rceil = 0.50$$

41. **C –** An increase in the standard deviation of demand will reduce the amount of safety stock that a company needs to hold

    C is false because an increase in the standard deviation of demand will increase, not reduce, the amount of safety stock that a company needs to hold.

42. **C –** Batch manufacturing

43. **D –** Manufacturing plant

    According to the bullwhip effect, companies located upstream in the supply chain will be more impacted by a change in customer demand.

44. **A –** Machines and workers are brought to the job

45. **B –** Assemble-to-order (ATO) product

46. **C –** The front room

47. **C –** The product quality will be higher

48. **A –** 0.67

$$C_p = \frac{UTL - LTL}{6\sigma}$$

$$= \frac{41 - 39}{6 * (0.50)} = \frac{2}{3} = 0.67$$

49. **B –** No

    The process capability ration is not ≥ 1.

50. **E –** All of the above

51. **C –** Fixed-position

52. **D –** All of the above

53. **B –** The flexibility of inventory increases as materials move down the supply chain

54. **A –** Periodic review system

55. **A –** Capital expenditures

56. **B –** The variable cost per unit is low when producing at high volumes on a production line

57. **B –** Safety stock

58. **C –** Transportation stock

59. **A –** Make-to-stock (MTS) product

60. **A –** 51.4 seconds

$$Takt\ time = \frac{Available\ production\ time}{Required\ output\ rate}$$

$$= \frac{(6\ hrs)(60\ mins\ per\ hour)(60\ secs\ per\ min)}{420\ units} = \frac{21{,}600\ seconds\ available}{420\ units\ required}$$

$$=$$

$$= 51.428$$

61. **C –** Examples of physical activities include tutoring and providing legal advice

These are intangible activities, not physical activities.

62. **A –** Economic order quantity

63. **B –** Dependent

64. **A –** Back room

65. **D –** 435 shirts

$$ROP = (40) * (7) + 1.28\sqrt{(7)(5)^2 + (40)^2(3)^2}$$

$$ROP = 280 + 1.28(120.73)$$

$$ROP = 280 + 154.53 = 434.53 = 435$$

66. **A –** 96 sec/unit

$$\boldsymbol{Takt\ time = \frac{Available\ production\ time}{Required\ output\ rate}}$$

$$Takt\ time = \frac{(8\ hours)(60\ mins\ per\ hour)(60\ seconds\ per\ minute)}{300\ units}$$

$$Takt\ time = \frac{28{,}800\ seconds}{300\ units} = 96\ seconds\ per\ unit$$

67. **A –** 0.015

$$\hat{\sigma} = \sqrt{\frac{\bar{p}(1-\bar{p})}{n}}$$

$= \sqrt{\frac{0.12(1-0.12)}{450}} = \sqrt{\frac{0.12(.88)}{450}} = 0.01531$ = 0.015

68. **B –** 0.165

$UCL = \bar{p} + 3\hat{\sigma}$
$UCL = 0.12 + 3(0.015)$
$UCL = 0.12 + 0.045 = 0.165$

69. **C –** 0.075

$LCL = \bar{p} - 3\hat{\sigma}$
$LCL = 0.12 - 3(0.015)$
$LCL = 0.12 - 0.045 = 0.075$

70. **A –** True

71. **A –** X-bar chart

72. **D –** External failure costs

73. **B –** 292

D = (190 units/week)(52 weeks) = 9,880
S = $90
H = ($420)(0.05) = $21

$$\boldsymbol{Economic\ Order\ Quantity\ (EOQ)} = \sqrt{\frac{\boldsymbol{2SD}}{\boldsymbol{H}}}$$

$$(EOQ) = \sqrt{\frac{(2)(90)(9{,}880)}{21}} = 291.0081 = 292$$

74. **D –** $6,111.21

$$\boldsymbol{Total\ Holding\ and\ Ordering\ Costs\ (TAC) = H\left(\frac{Q}{2}\right) + S\left(\frac{D}{Q}\right)}$$

$$(TAC) = 21\left(\frac{292}{2}\right) + 90\left(\frac{9{,}880}{292}\right)$$

$$(TAC) = 3{,}066 + 3{,}045.21 = \$6{,}111.21$$

75. **E –** 287

$$SS = z\sqrt{\overline{L}\sigma_d^2 + \overline{d}^2\sigma_L^2}$$

$$SS = 1.28\sqrt{(2)(3)^2 + (190)^2(1)^2}$$

$$SS = 1.28\sqrt{18 + 36{,}100}$$

$$SS = 1.28(190.05) = 243.264 = 244$$

76. **A –** 624

$$\boldsymbol{ROP = \overline{dL} + SS}$$

ROP = (190)(2) + 244

ROP = 380 + 244 = 624

77. **A –** Continuous review system

78. **D –** An automaker purchases four tires for each automobile that they produce

79. **B –** False

The value of goods on a per unit basis is greater when the goods are located downstream, not upstream, in the supply chain.

80. **C –** 0.061

$$\bar{p} = \frac{\sum_{j=1}^{m} p_j}{m}$$

$$\bar{p} = \frac{(6+7+1+4+2+10+6+3+2+2)}{(70*10)} = \frac{43}{700} = 0.061$$

81. **D –** 0.147

$$\hat{\sigma} = \sqrt{\frac{\bar{p}(1-\bar{p})}{n}}$$

$$= \sqrt{\frac{0.061(1-0.061)}{70}} = \sqrt{\frac{0.061(0.939)}{70}} = 0.0286$$

$$UCL = \bar{p} + 3\hat{\sigma}$$
$$UCL = 0.061 + 3(0.0286)$$
$$UCL = 0.061 + 0.0858 = 0.1468 = 0.147$$

82. **B –** 0

$$LCL = 0.061 - 3\hat{\sigma}$$
$$UCL = 0.061 + 3(0.0286)$$
$$UCL = 0.061 - 0.0858 = -0.0248 = 0$$

Remember, if your LCL is a negative value, set it to 0!

83. **B –** Appraisal

84. **A –** Continuous improvement

Use the Following Work for Problem #85 and #86

$$\overline{\overline{X}} = \frac{\sum_{j=1}^{m} \overline{X}_j}{m}$$

$$\bar{\bar{X}} = \frac{(13.2 + 13.3 + 14.1 + 12.6 + 12.2)}{5} = \frac{65.4}{5} = 13.08$$

$$\overline{R} = \frac{\sum_{j=1}^{m} R_j}{m}$$

$$\bar{R} = \frac{(1.3 + 1.3 + 2.3 + 1.3 + 0.9)}{5} = \frac{7.1}{5} = 1.42$$

Sample size (n) = 7

$A_2 = 0.42$

$D_3 = 0.08$

$D_4 = 1.92$

85. **A –** 2.7264; 0.1136

$UCL\ (R - chart) = D_4\bar{R}$

$UCL\ (R - chart) = (1.92)(1.42) = 2.7264$

$LCL\ (R - chart) = D_3\bar{R}$

$LCL\ (R - chart) = (0.08)(1.42) = 0.1136$

86. **C –** 13.6764; 12.4836

$$UCL\ (x-bar) = \bar{\bar{X}} + A_2\bar{R}$$
$$UCL = 13.08 + (0.42)(1.42)$$
$$UCL = 13.08 + 0.5964 = 13.6764$$

$$LCL\ (x-bar) = \bar{\bar{X}} - A_2\bar{R}$$
$$UCL = 13.08 - (0.42)(1.42)$$
$$UCL = 13.08 - 0.5964 = 12.4836$$

87. **D –** Process capability index

88. **B –** The consumer's risk

89. **D –** Periodic review system

90. **A –** 157

$$\boldsymbol{R = \mu_{RP+L} + z\sigma_{RP+L}}$$
$$R = 140 + (1.28)(13)$$
$$R = 140 + 16.64 = 156.64 = 157$$

91. **B –** 162

$$\boldsymbol{R = \mu_{RP+L} + z\sigma_{RP+L}}$$
$$R = 140 + (1.65)(13)$$
$$R = 140 + 21.45 = 161.45 = 162$$

92. **C –** 122

$$\boldsymbol{Q = R - I}$$
$$Q = 157 - 35 = 122$$

93. **A –** Internal failure costs

94. **D –** A and C

95. **C –** 191

$$\boldsymbol{Economic\ Order\ Quantity\ (EOQ)} = \sqrt{\frac{\boldsymbol{2SD}}{\boldsymbol{H}}}$$

$$(EOQ) = \sqrt{\frac{2(16)(670)}{3}} = 84.54 = 85$$

$$\boldsymbol{Adjusted\ Total\ Annual\ Inventory\ Cost\ (TAC)} = \boldsymbol{H}\left(\frac{\boldsymbol{Q}}{\boldsymbol{2}}\right) + \boldsymbol{S}\left(\frac{\boldsymbol{D}}{\boldsymbol{Q}}\right) + \boldsymbol{DP}$$

$$(TAC)\ at\ 85\ = 3\left(\frac{85}{2}\right) + 16\left(\frac{670}{85}\right) + (670 * 10.50)$$

$$(TAC)\ at\ 85\ = 127.5 + 126.12 + 7{,}035 = 7{,}288.62$$

$$(TAC)\ at\ 191\ = 3\left(\frac{191}{2}\right) + 16\left(\frac{670}{191}\right) + (670 * 7.25)$$

$$(TAC)\ at\ 191\ = 286.50 + 56.13 + 4{,}857.50 = 5{,}200.13$$

Since the total cost for ordering 191 units is less than the total cost for ordering 85 units, the company should order 191 units at a time to take advantage of the price discount.