Multiple Choice Questions

Chapter 10: Experimentation: Searching the Solution Space

1. The 'solution space' is:

   a. The best solution to the problem being addressed by the simulation
   b. The region that represents all possible combinations of values of the experimental factors
   c. The range of outputs that the simulation generates
   d. The area that contains the maximum number of solutions to the problem being addressed by the simulation

2. Which of the following is interactive experimentation useful for?

   a. Obtaining statistically significant results
   b. Understanding the long-run performance of a system
   c. Developing an understanding of the system and identifying possible improvements
   d. None of the above

3. A simulation is used to compare two scenarios for a service system: the first with 5 service points and the second with 6. A paired-t confidence interval (5% significance level) is calculated for the difference in the mean waiting time for the two scenarios, giving the interval (-0.193, 7.612). What can we conclude from this result?

   a. We are 95% confident that, in terms of waiting time, 6 service point is better than having 5
   b. We are certain that, in terms of waiting time, 5 service points is the best option
   c. We are 95% confident that, in terms of waiting time, there is no difference between the two scenarios
   d. We are certain that, in terms of waiting time, there is no difference between the two scenarios

4. A paired-t confidence interval should only be used to compare simulation scenarios when:

   a. Variance is reduced through the use of common random numbers
   b. There is no variance in the simulation output
   c. There is a clear difference between the results from the scenarios
   d. Multiple replications are being performed with each scenario

5. What is the paired-*t* confidence interval (assume $\alpha = 0.05$) for the difference between the values generated from the following two scenarios?

Scenario A: 9.59, 11.50, 13.80, 9.75, 13.67
Scenario B: 7.56, 6.96, 10.44, 7.73, 8.77

   a. -1.91, -0.32
   b. -0.73, 2.14
   c. 1.69, 5.05
   d. 3.61, 8.74

6. A simulation is used to compare the average time in system for 4 scenarios. A pair-wise comparison is performed for each scenario against all the other scenarios using confidence intervals for the difference in mean time in the system. To obtain an overall confidence of 95%, what significance level should be used?

   a. 5%
   b. 0.5%
   c. 1.25%
   d. 95%

7. A 2^k factorial design is used with a simulation of a coffee shop. Two factors are varied between a low and a high level: the number of baristas and the number of service tills. The results are shown in the table below.

Scenario	Number of baristas	Number of service tills	Waiting time (mins)
1	-	-	2.31
2	+	-	2.09
3	-	+	1.83
4	+	+	1.22

What is the main effect of increasing the number of baristas (- to +)?

   a. -0.42
   b. 0.42
   c. 0.68
   d. -0.68

8. Having run a series of replications for the four scenarios above, the main effect for increasing the number of service tills is found to be (-0.65, 0.41); expressed as a 95% confidence interval. What does this suggest about the benefit of adding service tills?

   a. It seems beneficial to increase the number of service tills
   b. It seems beneficial to reduce the number of service tills
   c. There seems to be no benefit from additional service tills
   d. None of the above

9. Following a series of simulation runs with the above coffee shop model, a multiple regression equation is fitted to the data, giving the following equation:

$$w = 5.31 - 1.04b - 0.17t$$

Where:

w = waiting time (mins)
b = number of baristas
t = number of service tills

Using this metamodel, what is the predicted waiting time with 2 baristas and 2 service tills?

a. 5.31
b. 4.22
c. 3.31
d. 2.89

10. Sensitivity analysis is useful for which of the following?

a. Assessing the effect of uncertainties in the data
b. Assessing the robustness of the proposed solution
c. Assessing the effect of changes to the model assumptions
d. All of the above