CHAPTER 3: PROJECT MANAGEMENT

TRUE/FALSE

1. Bechtel was selected to run the project of restoring Kuwait's oil fields in the 1990's even though the firm's competitive advantage was in supply chain management and logistics.
2. One phase of a large project is scheduling.
3. A project organization works best for an organization when the project resides in only one of its functional areas.
4. By their very nature, projects have a limited lifetime, and that sets project management apart from the management of more traditional activities.
5. One responsibility of a project manager is to make sure that the project meets its quality goals.
6. Work Breakdown Structure is a useful tool in project management because it addresses the timing.
7. Project managers have their own code of ethics, established by the Project Management Institute.
8. Ethical issues which can arise in projects include bid rigging, bribery, and "lowballing."
9. Gantt charts give a timeline for each of a project's activities, but do not adequately show the interrelationships of activities.
10. PERT, but not CPM, has the ability to consider the precedence relationships in a project.
11. The shortest of all paths through the network is the critical path.
12. The fundamental difference between PERT and CPM is that PERT uses the beta distribution for crashing projects while CPM uses cost estimates.
13. Slack is the amount of time an activity can be delayed without delaying the entire project.
14. Every network has at least one critical path.
15. The critical path can be determined by use of either the "forward pass" or the "backward pass."
16. The PERT pessimistic time estimate is an estimate of the minimum time an activity will require.
17. The standard deviation of project duration is the average of the standard deviation of all activities on the critical path.
18. In PERT analysis, the identification of the critical path can be incorrect if a noncritical activity takes substantially more than its expected time.
19. Shortening the project's duration by deleting unnecessary activities is called "project crashing."
20. In project management, crashing an activity must consider the impact on all paths in the network.

MULTIPLE CHOICE

21. Which of the following statements regarding Bechtel is true?
   a. Its competitive advantage is project management.
   b. The project of restoring Kuwait's oil fields was dominated by logistical issues.
   c. The Kuwai oil field restoration used the port of Dubai as a central transshipment point.
   d. Bechtel's procurement program is global in nature.
   e. All of the above are true.

22. Which of the following statements about Bechtel is true?
   a. Even though Bechtel is over 100 years old, the Kuwai oil fields was its first "project."
   b. Bechtel is the world's premier manager of massive construction and engineering projects.
   c. Bechtel's competitive advantage is supply chain management.
   d. While its projects are worldwide, its network of suppliers is largely in the U.S.
   e. All of the above are true.
23. The phases of project management are
   a. planning, scheduling, and controlling
   b. planning, programming, and budgeting
   c. planning, organizing, staffing, leading, and controlling
   d. different for manufacturing projects than for service projects
   e. GANTT, CPM, and PERT

24. A project organization
   a. is effective for companies with multiple large projects
   b. is appropriate only in construction firms
   c. often fails when the project cuts across organizational lines
   d. is formed to ensure that programs (projects) get proper management and attention
   e. a and d are both true

25. Which of the following statements regarding project management is false?
   a. Gantt charts give a timeline for each of a project's activities, but do not adequately show the interrelationships of activities.
   b. A project organization works best for a project that is temporary but critical to the organization.
   c. Project organization works well when the work contains simple, independent tasks.
   d. Gantt charts and PERT/CPM are never used together.
   e. None of the above is true.

26. A code of ethics especially for project managers
   a. has been established by the Project Management Institute
   b. has been formulated by the Federal government
   c. has been formulated by the World Trade Organization
   d. is inappropriate, since everyone should use the same guidance on ethical issues
   e. does not exist at this time

27. Divulging information to some bidders on a project to give them an unfair advantage
   a. is the same thing as altering a status report
   b. is bribery
   c. is permitted by NAFTA
   d. is known as bid rigging
   e. is acceptable for private corporations but not for government agencies

28. Ethical issues that may arise in projects large and small include
   a. bid rigging
   b. expense account padding
   c. compromised safety or health standards
   d. bribery
   e. All of the above are true.

29. Which of the following statements regarding Gantt charts is true?
   a. Gantt charts give a timeline and precedence relationships for each activity of a project.
   b. Gantt charts use the four standard spines of Methods, Materials, Manpower, and Machinery.
   c. Gantt charts are visual devices that show the duration of activities in a project.
   d. Gantt charts are expensive.
   e. All of the above are true.
30. Which of the following statements regarding critical paths is true?
   a. The shortest of all paths through the network is the critical path.
   b. Some activities on the critical path may have slack.
   c. Every network has exactly one critical path.
   d. On a specific project, there can be multiple critical paths, all with exactly the same duration.
   e. The duration of the critical path is the average duration of all paths in the project network.

31. Which of the following statements regarding CPM is true?
   a. The critical path is the shortest of all paths through the network.
   b. The critical path is that set of activities that has positive slack.
   c. Some networks have no critical path.
   d. All activities on the critical path have their LS equal their predecessor's EF.
   e. All of the above are false.

32. A simple CPM network has three activities, A, B, and C. A is an immediate predecessor of B and of C. B is an immediate predecessor of C. The activity durations are A=4, B=3, C=8.
   a. The critical path is A-B-C, duration 15.
   b. The critical path is A-C, duration 12.
   c. The critical path is A-B-C, duration 13.5
   d. The critical path cannot be determined without knowing PERT expected activity times.
   e. The network has no critical path.

33. A simple CPM network has three activities, D, E, and F. D is an immediate predecessor of E and of F. E is an immediate predecessor of F. The activity durations are D=4, E=3, F=8.
   a. The critical path is D-E-F, duration 15.
   b. The critical path is A-C, duration 12.
   c. Slack at D is 3 units
   d. Slack at E is 3 units
   e. Both a and c are true

34. A simple CPM network has five activities, A, B, C, D, and E. A is an immediate predecessor of C and of D. B is also an immediate predecessor of C and of D. C and D are both immediate predecessors of E.
   a. There are two paths in this network.
   b. There are four paths in this network.
   c. There are five paths in this network.
   d. There are 25 paths through this network.
   e. None of these statements is true.

35. Activity D on a CPM network has predecessors B and C, and has successor F. D has duration 6. B's earliest finish is 18, while C's is 20. F's late start is 26. Which of the following is true?
   a. B is a critical activity.
   b. C is completed before B.
   c. D has no slack but is not critical.
   d. D is critical, and has zero slack.
   e. All of the above are true.
36. Which of the following statements regarding CPM networks is **true**?
   a. There can be multiple critical paths on the same project, all with different durations.
   b. The early finish of an activity is the latest early start of all preceding activities.
   c. The late start of an activity is its late finish plus its duration.
   d. If a specific project has multiple critical paths, all of them will have the same duration.
   e. All of the above are true.

37. Activity M on a CPM network has predecessors N and R, and has successor S. M has duration 5. N's late finish is 18, while R's is 20. S's late start is 14. Which of the following is **true**?
   a. M is critical and has zero slack.
   b. M has no slack but is not critical.
   c. The last start time of S is impossible.
   d. N is a critical activity.
   e. S is a critical activity.

38. Which of the following statements concerning CPM activities is **false**?
   a. The early finish of an activity is the early start of that activity plus its duration.
   b. The late finish is the earliest of the late start times of all successor activities.
   c. The late start of an activity is its late finish less its duration.
   d. The late finish of an activity is the earliest late start of all preceding activities.
   e. The early start of an activity is the latest early finish of all preceding activities.

39. The time an activity will take assuming very unfavorable conditions is
   a. the optimistic time
   b. the pessimistic time
   c. the activity variance
   d. the minimum time
   e. exactly twice as long as the expected time

40. The critical path for the network activities shown below is _____ with duration _____.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Duration</th>
<th>Immediate Predecessors</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>4</td>
<td>---</td>
</tr>
<tr>
<td>B</td>
<td>2</td>
<td>A</td>
</tr>
<tr>
<td>C</td>
<td>7</td>
<td>--</td>
</tr>
<tr>
<td>D</td>
<td>4</td>
<td>A</td>
</tr>
<tr>
<td>E</td>
<td>5</td>
<td>B,C,D</td>
</tr>
</tbody>
</table>

   a. A-B-D; 10
   b. A-B-E; 11
   c. C-E; 12
   d. A-D-E; 13
   e. A-B-C-D-E; 22
41. The critical path for the network activities shown below is _____ with duration ______.

<table>
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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>2</td>
<td>--</td>
</tr>
<tr>
<td>B</td>
<td>4</td>
<td>--</td>
</tr>
<tr>
<td>C</td>
<td>6</td>
<td>A,B</td>
</tr>
<tr>
<td>D</td>
<td>1</td>
<td>A,B</td>
</tr>
<tr>
<td>E</td>
<td>2</td>
<td>B,C,D</td>
</tr>
</tbody>
</table>

a. A-D-E; 5  
b. B-E; 6  
c. B-D-E; 7  
d. A-C-E; 10  
e. B-C-E; 12

42. The _____ distribution is used by PERT analysis to calculate expected activity times and variances.

a. Normal  
b. Beta  
c. Alpha  
d. Gaussian  
e. Binomial

43. The expected activity time in PERT analysis is calculated as

a. the simple average of the optimistic, pessimistic, and most likely times  
b. the weighted average of a, m, and b, with m weighted 4 times as heavily as a and b  
c. the sum of the optimistic, pessimistic, and most likely times  
d. the sum of the optimistic, pessimistic, and most likely times, divided by six  
e. the sum of the activity variances, divided by six

44. The critical path for the network activities shown below is _____ with duration ______.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Duration</th>
<th>Immediate Predecessors</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>10</td>
<td>---</td>
</tr>
<tr>
<td>B</td>
<td>8</td>
<td>---</td>
</tr>
<tr>
<td>C</td>
<td>2</td>
<td>A</td>
</tr>
<tr>
<td>D</td>
<td>4</td>
<td>A</td>
</tr>
<tr>
<td>E</td>
<td>5</td>
<td>B,C</td>
</tr>
</tbody>
</table>

a. A-C; 12  
b. A-D-E; 19  
c. B-E; 13  
d. A-B-C-D-E; 29  
e. none of the above
45. Which of the following statements regarding PERT times is true?
   a. The optimistic time estimate is an estimate of the minimum time an activity will require.
   b. The optimistic time estimate is an estimate of the maximum time an activity will require.
   c. The probable time estimate is calculated as \( t = (a + 4m + b) \).
   d. Pessimistic time estimate is an estimate of the minimum time an activity will require.
   e. Most likely time estimate is an estimate of the maximum time an activity will require.

46. Which of the following statements regarding PERT times is true?
   a. Expected time is an estimate of the time an activity will require if everything goes as planned.
   b. The optimistic time estimate is an estimate of the maximum time an activity will require.
   c. The probable time estimate is calculated as \( t = (a + 4m + b)/6 \).
   d. Pessimistic time estimate is an estimate of the minimum time an activity will require.
   e. Most likely time estimate is an estimate of the maximum time an activity will require.

47. The Beta distribution is used in project management to
   a. calculate slack on activities not on the critical path
   b. calculate the probability that a project will be completed within its budget
   c. calculate pessimistic and optimistic activity times
   d. determine which activity should be crashed
   e. none of the above

48. The Beta distribution is used in project management to
   a. determine which activity should be crashed
   b. calculate the probability that a project will be completed within its budget
   c. calculate expected activity times
   d. calculate slack for activities on the critical path
   e. none of the above

49. In a PERT network, non-critical activities that have little slack need to be monitored closely
   a. because PERT treats all activities as equally important
   b. because near-critical paths could become critical paths with small delays in these activities
   c. because slack is undesirable and needs to be eliminated
   d. because they are causing the entire project to be delayed
   e. because they have a high risk of not being completed

50. Which of the following statements regarding PERT analysis is true?
   a. Each activity has two estimates of its duration.
   b. Project variance is the sum of all activity variances.
   c. Project standard deviation is the sum of all critical activity standard deviations.
   d. Only critical activities contribute to the project variance.
   e. None of the above is true.
51. A project being analyzed by PERT has 60 activities, 13 of which are on the critical path. If the estimated time along the critical path is 214 days with a project variance of 100, the probability that the project will take 224 days or more to complete is
   a. near zero
   b. 0.0126
   c. 0.1587
   d. 0.8413
   e. 2.14

52. An activity on a PERT network has these time estimates: optimistic = 2, most likely = 5, and pessimistic = 10. Its expected time is
   a. 5
   b. 5.33
   c. 5.67
   d. 17
   e. none of these

53. An activity on a PERT network has these time estimates: optimistic = 1, most likely = 2, and pessimistic = 5. Its expected time is
   a. 2
   b. 2.33
   c. 2.67
   d. 8
   e. none of these

54. An activity on a PERT network has these time estimates: optimistic = 2, most likely = 3, and pessimistic = 8. Its expected time and variance (if it is a critical activity) are
   a. 3.67; 1
   b. 3.67; 6
   c. 4.33; 1
   d. 4.33; 6
   e. none of these

55. A local project being analyzed by PERT has 42 activities, 13 of which are on the critical path. If the estimated time along the critical path is 105 days with a project variance of 25, the probability that the project will be completed in 95 days or less is
   a. -0.4
   b. 0.0228
   c. 0.3444
   d. 0.9772
   e. 4.2
56. A project being analyzed by PERT has 38 activities, 16 of which are on the critical path. If the estimated time along the critical path is 90 days with a project variance of 25, the probability that the project will be completed in 88 days or less is
   a. 0.0228
   b. 0.3446
   c. 0.6554
   d. 0.9772
   e. 18

57. A PERT project has 45 activities, 19 of which are on the critical path. The estimated time for the critical path is 120 days. The sum of all activity variances is 64, while the sum of variances along the critical path is 36. The probability that the project can be completed between days 108 and 120 is
   a. -2.00
   b. 0.0227
   c. 0.1058
   d. 0.4773
   e. 0.9773

58. A contractor's project being analyzed by PERT has an estimated time for the critical path of 120 days. The sum of all activity variances is 81; the sum of variances along the critical path is 64. The probability that the project will take 130 or more days to complete is
   a. 0.1056
   b. 0.1335
   c. 0.8512
   d. 0.8943
   e. 1.29

59. Analysis of a PERT problem shows the estimated time for the critical path to be 108 days with a variance of 64. There is a .90 probability that the project will be completed before approximately day _____.
   a. 98
   b. 108
   c. 109
   d. 115
   e. 118

60. A project whose critical path has an estimated time of 120 days with a variance of 100 has a 20% chance that the project will be completed before day _____ (rounded to nearest day).
   a. 98
   b. 112
   c. 120
   d. 124
   e. 220
61. A project whose critical path has an estimated time of 820 days with a variance of 225 has a 20% chance that the project will be completed before day ______ (rounded to nearest day).
   a. 631  
   b. 689  
   c. 807  
   d. 833  
   e. 1009

62. Contract requirements state that a project must be completed within 180 working days, or it will incur penalties for late completion. Analysis of the activity network reveals an estimated project time of 145 working days with a project variance of 400. What is the probability that the project will be completed before the late-payment deadline?
   a. 0.0401  
   b. 0.4599  
   c. 0.8056  
   d. 0.9599  
   e. near 1.0000, or almost certain

63. Which of these statements regarding time-cost tradeoffs in CPM networks is true?
   a. Crashing is not possible unless there are multiple critical paths.  
   b. Crashing a project often reduces the length of long-duration, but noncritical, activities.  
   c. Activities not on the critical path can never be on the critical path, even after crashing.  
   d. Crashing shortens the project duration by assigning more resources to one or more of the critical tasks.  
   e. None of the above is true.

64. Which of the following statements regarding project management is true?
   a. Both PERT and CPM require that network tasks have unchanging durations.  
   b. "Project crashing" shortens a project by assigning more resources to at least one critical task  
   c. Crashing need not consider the impact of crashing an activity on other paths in the network.  
   d. Project crashing is an optimizing technique.  
   e. Crash cost depends upon the variance of the activity to be crashed.

65. Which of the following statements regarding time-cost tradeoffs in CPM networks is false?
   a. "Project Crashing" shortens project duration by assigning more resources to critical tasks.  
   b. Crashing sometimes has the reverse result of lengthening the project duration.  
   c. Crashing must consider the impact of crashing an activity on all paths in the network.  
   d. Activities not on the critical path can become critical after crashing takes place.  
   e. All of the above are true.
66. If an activity whose normal duration is 13 days can be shortened to 10 days for an added cost of $1,500, the crash cost per period is
   a. $500
   b. $750
   b. $1,500
   d. $13,000
   e. $15,000

67. Two activities are candidates for crashing on a CPM network. Activity details are in the table below. To cut one day from the project's duration, activity _____ should be crashed first, adding ______ to project cost.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Normal Time</th>
<th>Normal Cost</th>
<th>Crash Duration</th>
<th>Crash Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>One</td>
<td>8 days</td>
<td>$6,000</td>
<td>6 days</td>
<td>$6,800</td>
</tr>
<tr>
<td>Two</td>
<td>10 days</td>
<td>$4,000</td>
<td>9 days</td>
<td>$5,000</td>
</tr>
</tbody>
</table>

   a. One; $400
   b. One; $6,800
   c. Two; $1,000
   d. Two; $5,000
   e. One or two should be crashed; $1,400

68. If an activity whose normal duration is 15 days can be shortened to 10 days for an added cost of $2,000, the crash cost per period is
   a. $400
   b. $2,000
   c. $10,000
   d. $20,000
   e. $30,000

69. A network has been crashed to the point where all activities are critical. Additional crashing
   a. is unnecessary
   b. is impossible
   c. is prohibitively expensive
   d. may require crashing multiple tasks simultaneously
   e. can be done, but all critical tasks must be reduced in duration
70. Two activities are candidates for crashing on a CPM network. Activity details are in the table below. To cut one day from the project’s duration, activity _____ should be crashed first, adding ______ to project cost.

<table>
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<th>Normal Cost</th>
<th>Crash Duration</th>
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</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>4 days</td>
<td>$6,000</td>
<td>3 days</td>
<td>$8,000</td>
</tr>
<tr>
<td>C</td>
<td>6 days</td>
<td>$4,000</td>
<td>4 days</td>
<td>$6,000</td>
</tr>
</tbody>
</table>

a. B; $2,000  
b. B; $8,000  
c. C; $1,000  
d. C; $2,000  
e. C; $6,000