**Chapter 9 Supplement: Tools for Analyzing, Designing, and Selecting Processes and Layouts**

**Practice Problems**

**MULTIPLE CHOICE**

Hasgood Industries has just received a major long-term contract. They need to expand the production capabilities particularly in stamping out large parts. They gathered information on four hydraulic presses that would perform this task. The product will be sold at $100 per unit. Information on the cost of the four possible hydraulic presses are presented below.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Raster | Jacobs | Matsuki | Helgard |
| Fixed Costs | $90,000 | $120,000 | $145,000 | $160,000 |
| Variable Costs | $40 | $38 | $35 | $31 |

1. Assuming a production run of 10,000 units, what would be the break-even point for the use of the Raster machine?

|  |  |
| --- | --- |
| a. | 1,500 |
| b. | 1,750 |
| c. | 1,950 |
| d. | 2,200 |

ANS: A PTS: 1 DIF: Easy

2. Assuming a production run of 10,000 units, what would be the break-even point for the use of the Jacobs machine?

|  |  |
| --- | --- |
| a. | 1,500 |
| b. | 1,834 |
| c. | 1,935 |
| d. | 2,136 |

ANS: C PTS: 1 DIF: Easy

3. Assuming a production run of 10,000 units, what would be the break-even point for the use of the Matsuki machine?

|  |  |
| --- | --- |
| a. | 1,935 |
| b. | 2,231 |
| c. | 2,346 |
| d. | 2,456 |

ANS: B PTS: 1 DIF: Easy

4. Assuming a production run of 10,000 units, what would be the break-even point for the use of the Helgard machine?

|  |  |
| --- | --- |
| a. | 2,246 |
| b. | 2,319 |
| c. | 2,514 |
| d. | 2,643 |

ANS: B PTS: 1 DIF: Easy

5. At what value would be Raster hydraulic press be equivalent to the Jacobs hydraulic press?

|  |  |
| --- | --- |
| a. | 15,000 |
| b. | 20,000 |
| c. | 33,000 |
| d. | 56,000 |

ANS: A PTS: 1 DIF: Medium

6. At what value would the Jacobs hydraulic press be equivalent to the Matsuki hydraulic press?

|  |  |
| --- | --- |
| a. | 6,667 |
| b. | 8,333 |
| c. | 9,000 |
| d. | 9,667 |

ANS: B PTS: 1 DIF: Medium

7. At what value would be Matsuki hydraulic press be equivalent to the Helgard hydraulic press?

|  |  |
| --- | --- |
| a. | 2,750 |
| b. | 3,750 |
| c. | 4,167 |
| d. | 5,333 |

ANS: B PTS: 1 DIF: Medium

8. At what value would be Raster hydraulic press be equivalent to the Helgard hydraulic press?

|  |  |
| --- | --- |
| a. | 7,778 |
| b. | 8,333 |
| c. | 9,000 |
| d. | 9,667 |

ANS: A PTS: 1 DIF: Medium

9. If the long-term order was increased to 12,500 units, which hydraulic press would be most profitable?

|  |  |
| --- | --- |
| a. | Raster |
| b. | Jacobs |
| c. | Matsuki |
| d. | Helgard |

ANS: D PTS: 1 DIF: Hard

Xebec Technologies Corporation has set up a small “skunk works” operation in San Diego. The purpose of a “skunk works” is to be able to rapidly develop new products. Xebec technologies Corporation is looking at a building that it would purchase for this “skunk works.” The current plan for layout of the facilities is given below.

|  |  |  |
| --- | --- | --- |
| Drafting | Design | Fabrication |
| Prototyping | Engineering | Offices |

They've also estimated the material flows across the six departments that would be located in this building. Those material flows are given below.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Movement Matrix** | | | | | | |
|  | Drafting | Design | Fabrication | Prototyping | Engineering | Offices |
| Drafting |  | 100 | 60 | 50 | 200 | 10 |
| Design |  |  | 150 | 250 | 300 | 20 |
| Fabrication |  |  |  | 150 | 100 | 10 |
| Prototyping |  |  |  |  | 300 | 20 |
| Engineering |  |  |  |  |  | 50 |
| Offices |  |  |  |  |  |  |

Given the preliminary layout, the distance moved among the departments is provided in the matrix below.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Distance Matrix** | | | | | | |
|  | Drafting | Design | Fabrication | Prototyping | Engineering | Offices |
| Drafting |  | 25 | 50 | 25 | 50 | 75 |
| Design |  |  | 25 | 50 | 25 | 50 |
| Fabrication |  |  |  | 75 | 50 | 25 |
| Prototyping |  |  |  |  | 25 | 50 |
| Engineering |  |  |  |  |  | 25 |
| Offices |  |  |  |  |  |  |

10. Given this initial layout, what would be the material distance flow from Drafting to Prototyping?

|  |  |
| --- | --- |
| a. | 750 |
| b. | 1,000 |
| c. | 1,250 |
| d. | 2,500 |

ANS: C PTS: 1 DIF: Easy

11. Given this initial layout, what would be the material distance flow from Prototyping to Engineering?

|  |  |
| --- | --- |
| a. | 1,500 |
| b. | 2,500 |
| c. | 3,500 |
| d. | 7,500 |

ANS: D PTS: 1 DIF: Easy

12. Given this initial layout, what would be the material distance flow from Engineering to Offices?

|  |  |
| --- | --- |
| a. | 500 |
| b. | 750 |
| c. | 1,000 |
| d. | 1,250 |

ANS: C PTS: 1 DIF: Easy

13. Given this revised layout, what would be the material distance flow from Fabrication to Design?

|  |  |
| --- | --- |
| a. | 1,000 |
| b. | 1,500 |
| c. | 2,500 |
| d. | 3,750 |

ANS: D PTS: 1 DIF: Hard

14. Given this initial layout, what would be the total material distance flow?

|  |  |
| --- | --- |
| a. | 58,750 |
| b. | 60,750 |
| c. | 68,500 |
| d. | 75,000 |

ANS: C PTS: 1 DIF: Hard

15. Based on the materials flow, which two departments would you want to be assured were adjacent to each other?

|  |  |
| --- | --- |
| a. | Prototyping and Engineering |
| b. | Prototyping and Design |
| c. | Prototyping and Fabrication |
| d. | Drafting and Engineering |

ANS: A PTS: 1 DIF: Easy

16. The owner of the building suggested a different layout, which is given below.

|  |  |  |
| --- | --- | --- |
| Fabrication | Design | Drafting |
| Proto | Engineering | Offices |

This produces the following distance matrix.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Drafting | Design | Fabrication | Prototyping | Engineering | Offices |
| Drafting |  | 25 | 50 | 75 | 50 | 25 |
| Design |  |  | 25 | 50 | 25 | 50 |
| Fabrication |  |  |  | 25 | 50 | 75 |
| Prototyping |  |  |  |  | 25 | 50 |
| Engineering |  |  |  |  |  | 25 |
| Offices |  |  |  |  |  |  |

Given this revised layout, what would be the material distance flow from drafting to prototyping?

|  |  |
| --- | --- |
| a. | 1,000 |
| b. | 1,500 |
| c. | 2,500 |
| d. | 3,750 |

ANS: D PTS: 1 DIF: Medium

17. Given this revised layout, what would be the material distance flow from Fabrication to Design?

|  |  |
| --- | --- |
| a. | 750 |
| b. | 1,500 |
| c. | 3,750 |
| d. | 12,500 |

ANS: C PTS: 1 DIF: Medium

18. Given this revised layout, what would be the material distance flow from Prototyping to Design?

|  |  |
| --- | --- |
| a. | 6,000 |
| b. | 9,000 |
| c. | 12,500 |
| d. | 17,500 |

ANS: C PTS: 1 DIF: Medium

19. Given this revised layout, what would be the total material distance flow?

|  |  |
| --- | --- |
| a. | 61,000 |
| b. | 62,000 |
| c. | 63,500 |
| d. | 68,500 |

ANS: C PTS: 1 DIF: Medium

20. What is the difference (if any) in total material distance flow between the initial layout and the revised layout?

|  |  |
| --- | --- |
| a. | 5,000 |
| b. | 9,000 |
| c. | 12,500 |
| d. | 17,500 |

ANS: A PTS: 1 DIF: Hard

Lazer Bicycles produces high-end racing bikes. One of the most innovative elements of their design is a sophisticated transmission. There are several steps that are required to produce this transmission. These activities, their precedence relationships, and the time to perform the activities are given in the table below

.

|  |  |  |
| --- | --- | --- |
| Activity | Predecessor | Time (in Minutes) |
| A | — | 2 |
| B | A | 3 |
| C | B | 5 |
| D | B | 2 |
| E | C | 1 |
| F | D, E | 6 |

21. If the demand was for 60 transmissions during an 8-hour day, what would be the required cycle time to produce the transmission?

|  |  |
| --- | --- |
| a. | 6 minutes |
| b. | 8 minutes |
| c. | 10 minutes |
| d. | 19 minutes |

ANS: B PTS: 1 DIF: Medium

22. What would be the theoretical number of workstations required to achieve that cycle time?

|  |  |
| --- | --- |
| a. | 1.00 |
| b. | 2.13 |
| c. | 3.84 |
| d. | 5.12 |

ANS: B PTS: 1 DIF: Medium

23. What would be the actual number of workstations for the cycle time?

|  |  |
| --- | --- |
| a. | 1 |
| b. | 2 |
| c. | 3 |
| d. | 4 |

ANS: C PTS: 1 DIF: Medium

24. What would be the idle time for the system?

|  |  |
| --- | --- |
| a. | 0 |
| b. | 3 |
| c. | 4 |
| d. | 5 |

ANS: D PTS: 1 DIF: Easy

25. Utilizing the most-following-tasks rule, what would be a suggested layout?

|  |  |
| --- | --- |
| a. | A - CB - DE - F |
| b. | AB - CD - EF |
| c. | AC - BD - EF |
| d. | ABD - CE - F |

ANS: D PTS: 1 DIF: Hard

26. What would be the efficiency for this type of layout?

|  |  |
| --- | --- |
| a. | 65% |
| b. | 73% |
| c. | 79% |
| d. | 83% |

ANS: C PTS: 1 DIF: Medium

27. Utilizing the ranked-positional-weight rule, what would be a suggested layout?

|  |  |
| --- | --- |
| a. | ABC - DE - F |
| b. | ABD - CE - F |
| c. | A - CB - DE - F |
| d. | AC - BD - EF |

ANS: B PTS: 1 DIF: Hard

28. What would be the efficiency for this type of layout?

|  |  |
| --- | --- |
| a. | 65% |
| b. | 73% |
| c. | 79% |
| d. | 83% |

ANS: C PTS: 1 DIF: Medium

Consolidated Manufacturers produces commercial security systems. The master control panel is fairly complex. There are several steps that are required to produce this control panel. These activities, their precedence relationships, and the time to perform the activities are given in the table below.

|  |  |  |
| --- | --- | --- |
| Activity | Predecessor | Time (in Seconds) |
| A | — | 150 |
| B | — | 260 |
| C | A | 60 |
| D | B | 190 |
| E | C, D | 90 |
| F | D, E | 120 |
| G | C, F | 120 |
| H | F, G | 240 |

29. If the demand was for 100 control panels during an 8-hour day, what would be the required cycle time to produce these panels?

|  |  |
| --- | --- |
| a. | 200 seconds |
| b. | 240 seconds |
| c. | 276 seconds |
| d. | 288 seconds |

ANS: D PTS: 1 DIF: Medium

30. What would be the theoretical number of workstations required to achieve that cycle time?

|  |  |
| --- | --- |
| a. | 3.275 |
| b. | 4.125 |
| c. | 4.375 |
| d. | 5.125 |

ANS: C PTS: 1 DIF: Medium

31. What would be the actual number of workstations for the cycle time when using the most-following-tasks rule?

|  |  |
| --- | --- |
| a. | 4 |
| b. | 5 |
| c. | 6 |
| d. | 7 |

ANS: B PTS: 1 DIF: Easy

32. What would be the idle time for the system?

|  |  |
| --- | --- |
| a. | 0 seconds |
| b. | 90 seconds |
| c. | 180 seconds |
| d. | 240 seconds |

ANS: C PTS: 1 DIF: Medium

33. Utilizing the most-following-tasks rule, what would be the suggested layout?

|  |  |
| --- | --- |
| a. | A - B - CDE - FG - H |
| b. | A - B - CDF - EG - H |
| c. | B - AC - DE - FG - H |
| d. | B - AD - EF - CG - H |

ANS: C PTS: 1 DIF: Hard

34. What would be the efficiency for this type of layout?

|  |  |
| --- | --- |
| a. | 65.6% |
| b. | 73.6% |
| c. | 79.3% |
| d. | 87.5% |

ANS: D PTS: 1 DIF: Medium

35. Utilizing the ranked-positional-weight rule, what would be the suggested layout?

|  |  |
| --- | --- |
| a. | A - B - CDE - FG - H |
| b. | A - B - CDF - EG - H |
| c. | B - AC - DE - FG - H |
| d. | B - AD - EF - CG - H |

ANS: C PTS: 1 DIF: Medium

36. What would be the efficiency for this type of layout?

|  |  |
| --- | --- |
| a. | 65.6% |
| b. | 73.6% |
| c. | 79.3% |
| d. | 87.5% |

ANS: D PTS: 1 DIF: Medium

37. If the demand was increased to 120 control panels during an 8-hour day, what would be the required cycle time to produce these panels?

|  |  |
| --- | --- |
| a. | 200 seconds |
| b. | 240 seconds |
| c. | 276 seconds |
| d. | 288 seconds |

ANS: B PTS: 1 DIF: Medium

38. What would be the actual number of workstations for the cycle time?

|  |  |
| --- | --- |
| a. | 4 |
| b. | 5 |
| c. | 6 |
| d. | Cannot be accomplished with this information |

ANS: D PTS: 1 DIF: Easy

39. Utilizing the most-following-tasks rule, what would be the suggested layout?

|  |  |
| --- | --- |
| a. | A - B - CDE - FG - H |
| b. | A - B - CDF - EG - H |
| c. | B - AC - DE - FG - H |
| d. | A layout cannot be created to produce that level. |

ANS: D PTS: 1 DIF: Hard

40. What would be the efficiency for this type of layout?

|  |  |
| --- | --- |
| a. | A layout cannot be created to produce that level. |
| b. | 73.6% |
| c. | 79.3% |
| d. | 87.5% |

ANS: A PTS: 1 DIF: Medium

Miskatonic University has to review the records of seniors in order to determine if they can graduate. It also has to determine if they are suitable for honors at graduation or if they should be recipients of special prizes for excellence in particular disciplines. They’ve mapped out the required activities, the precedence relationships, and estimates of time to complete these activities. These data are available on table given below.

|  |  |  |
| --- | --- | --- |
| Activity | Predecessor | Time (in Seconds) |
| A | — | 90 |
| B | A | 70 |
| C | — | 70 |
| D | A, B | 130 |
| E | D | 90 |
| F | C, E | 90 |
| G | E | 70 |
| H | F | 55 |
| I | G, H | 90 |
| J | I | 95 |
| K | J | 60 |

41. If Miskatonic University wanted to process the records of 180 students during an 8-hour day, what would be the required cycle time to review their records?

|  |  |
| --- | --- |
| a. | 124 |
| b. | 144 |
| c. | 160 |
| d. | 180 |

ANS: C PTS: 1 DIF: Medium

42. What would be the actual number of workstations for the cycle time?

|  |  |
| --- | --- |
| a. | 5 |
| b. | 6 |
| c. | 7 |
| d. | 8 |

ANS: C PTS: 1 DIF: Medium

43. Utilizing the most-following-tasks rule, what would be the suggested layout?

|  |  |
| --- | --- |
| a. | AB - CE - D - EFG - HI - JK |
| b. | AC - BE - EF - GH - I - JK |
| c. | AB - D - CF - EG - HI - JK |
| d. | A layout can not be created to produce that level. |

ANS: C PTS: 1 DIF: Hard

44. What would be the efficiency for this type of layout?

|  |  |
| --- | --- |
| a. | 88.9% |
| b. | 90.3% |
| c. | 94.8% |
| d. | A layout can not be created to produce that level. |

ANS: C PTS: 1 DIF: Medium

45. What would be the idle time for the suggested layout?

|  |  |
| --- | --- |
| a. | 30 seconds |
| b. | 50 seconds |
| c. | 70 seconds |
| d. | 90 seconds |

ANS: B PTS: 1 DIF: Medium

46. If Miskatonic University wanted to process the records of 200 students during an 8-hour day, what would be the required cycle time to review their records?

|  |  |
| --- | --- |
| a. | 124 |
| b. | 144 |
| c. | 160 |
| d. | 180 |

ANS: B PTS: 1 DIF: Medium

47. What would be the theoretical number of workstations required to achieve that cycle time?

|  |  |
| --- | --- |
| a. | 5.32 |
| b. | 6.32 |
| c. | 6.88 |
| d. | 7.24 |

ANS: B PTS: 1 DIF: Medium

48. When considering the activity times, what would be the actual number of workstations required to achieve that cycle time?

|  |  |
| --- | --- |
| a. | 8 |
| b. | 9 |
| c. | 10 |
| d. | 11 |

ANS: D PTS: 1 DIF: Hard

49. Utilizing the most-following-tasks rule, what would be the suggested layout?

|  |  |
| --- | --- |
| a. | AB - D - C - E - FG - HI - J - K |
| b. | C - A - B - D - E - G - F - H - I - J - K |
| c. | C - AB - DF - EG - HI - J - K |
| d. | A - C - BD - EG - H - IJ - K |

ANS: B PTS: 1 DIF: Hard

50. What would be the efficiency for this type of layout?

|  |  |
| --- | --- |
| a. | 57% |
| b. | 63% |
| c. | 68% |
| d. | 77% |

ANS: A PTS: 1 DIF: Medium