1. The matrix of *total costs per day* for jobs 1, 2, and 3—if assigned at facilities A, B, and C of the Rivet and Nail Factory—is

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| **Facilities** |
|  |  | **A** | **B** | **C** |
| **Jobs** | 1 | $1,000 | $900 | $1,200 |
|  | 2 | 800 | 700 | 900 |
|  | 3 | 1,500 | 1,800 | 2,000 |

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What relatively permanent assignments will minimize total costs per day?

1. The matrix of *costs per part* for jobs 4, 5, and 6—if assigned at facilities A, B, and C of the Rivet and Nail Factory—is

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| **Facilities** |
|  |  | **A** | **B** | **C** |
| **Jobs** | 4 | $0.10 | $0.19 | $0.12 |
|  | 5 | 0.16 | 0.14 | 0.18 |
|  | 6 | 0.30 | 0.36 | 0.40 |

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The jobs are all of the same size (5,000) and duration. What relatively permanent assignments will minimize total costs?

1. The matrix of costs per part for jobs 7, 8, and 9 if assigned at facilities A, B, and C of the Rivet and Nail Factory is described by the matrix:

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| **Facilities** |
|  |  | **A** | **B** | **C** |
| **Jobs** | 7 | $0.10 | 0.09 | $0.12 |
|  | 8 | 0.08 | 0.07 | 0.09 |
|  | 9 | 0.30 | 0.36 | 0.40 |

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The jobs are all of the same size (5,000 units) and duration. What relatively permanent assignments will minimize total costs?

1. The Door Knob Company has four orders on hand, and each must be processed in the sequential order:

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 First: Department A—press shop

Second: Department B—plating and finishing

The following table lists the number of days required for each job in each department. For example, job IV requires one day in the press shop and one day in the finishing department.

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| --- | --- | --- | --- | --- |
|  | **Job I** | **Job II** | **Job III** | **Job IV** |
| **Department A** | 8 | 6 | 5 | 1 |
| **Department B** | 8 | 3 | 4 | 1 |

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Assume that no other work is being done by the departments and that "no passing" of jobs is allowed.Use a Gantt sequencing chart (see Figure 16-7) to show the best-work schedule. (Best-work schedule means minimum time to finish all four jobs.)

|  |  |
| --- | --- |
|  | **Figure 16-7 Gantt Sequencing Chart for *n*× 2 Problem Where *n* = 5 Persons Being Processed by *m* = 2 Facilities** |
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| http://www.atomicdog.com/myBackpack/Titles/MS-274-2/images/fig16-7.gif |

 |

3. Line efficiency (A)) is a measure used to assess line balance. It is given by Equation 17-6. Determine line efficiency for The Photo Lab where *n* = 4, *C* = 1.5 minutes, and total work content is 4.8.

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| Equation 17-6 |

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| --- |
| L = *TWC/nC* = Siti *where and i = all operations* |

 |

4. Determine line efficiency (described in Problem 3) and relate it to the balance delay measure (given in Equation 17-4) for the following conditions: Total work content is 3 hours; there are 180 stations operating with a cycle time of one minute. Compare the results and meanings of *d* and A .

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| Equation 17 - 4 |

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| *d* = 100(*nC*–S*iti*) ÷*nC* |

 |

For The Photo Lab, what happens if *t*max can be reduced from 1.0 to 0.7 by improving the technology of the film development step *i* = 6? Refer to Figure 17-2 and Tables 17-2 and 17-3.

**Figure 17-2**



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| **Table 17-2 Operation Times for The Photo Lab** |

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|  |  |
| --- | --- |
| **Operation (*i*)** | **Operation Time (*ti*) in Minutes** |
| 1 | 0.4 |
| 2 | 0.5 |
| 3 | 0.6 |
| 4 | 0.7 |
| 5 | 0.5 |
| 6 | 1.0 = *tmax* |
| 7 | 0.6 |
| 8 | 0.1 |
| 9 | 0.4 |

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| Note: *tmax* = 1.0 minute is the longest operation time. |

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| **Table 17-3 The Photo Lab's Processing Times** |

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|  |  |
| --- | --- |
| **Operation (*i*)** | **Operation Time (*ti*) in Minutes** |
| 1 | 0.4 |
| 2 | 0.5 |
| 3 | 0.6 |
| 4 | 0.7 |
| 5 | 0.5 |
| 6 | 1.0 = *tmax* |
| 7 | 0.6 |
| 8 | 0.1 |
| 9 | 0.4 |
| *TWC* | 4.8 = S*iti* |

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|  |
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| Note: *TWC* = total work content = S*iti* = 4.8 minutes. |

 |

6. Using the information in Problem 5, what occurs if *tmax* is reduced from 1.0 to 0.6 by installing two photo developing units in parallel for operation (6)? Develop a table similar to Table 17-4.

|  |
| --- |
| **Table 17-4 The Photo Lab's Chart of Possible Cycle Times, *C*, Also Hourly Output Rates, *O = T/C*, for Number of Stations, *n*** |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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|  |  |  |  |
| --- | --- | --- | --- |
| ***n*** | ***C = Siti/n* in Minutes** | ***O = T/C = 60/C Orders/Hour*** | **Total Idle Time in Minutes** |
| 1 | 4.8 | 12.5 | 0 |
| 2 | 2.4 | 25.0 | 0 |
| 3 | 1.6 | 37.5 | 0 |
| 4 | 1.2 | 50.0 | 0 |
| \*5 | 0.96 | 62.5 | 0 |
| \*6 | 0.80 | 75.0 | 0 |
| \*7 | 0.69 | 87.5 | 0 |
| \*8 | 0.60 | 100.0 | 0 |
| \*9 | 0.53 | 112.5 | 0 |

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| Note: (\* = infeasible) |