BLG 368E- Operations Research

Final Questions (2015)

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1. (90 Points) TESODEV is the leading technology company of Turkey. Tesodev has two factory, situated in Istanbul and Çorum. Tesodev has four Warehouse, situated in Trabzon, Antalya, Erzurum, Konya. Tesodev is selling products at the Tesodev Techno-Markets, situated in Cevahir, Ankamall, Ninovapark, Piazza, Palm City shopping mall. Tesodev produces 3 types of high tech products (kardex, annex, babax).

TESODEV wants to minimize cost of shipping. How should the TESODEV distribute the products? Find the total cost of shipping?

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |
| Capacity (Warehouse/Product) | | |  |  |  |
|  | Trabzon | Antalya | Erzurum | Konya |  |
| Kardex | 35.000 | 20.000 | 30.000 | 15.000 |  |
| Annex | 30.000 | 25.000 | 15.000 | 24.000 |  |
| Babax | 20.000 | 20.000 | 25.000 | 20.000 |  |
|  |  |  |  |  |  |
| Capacity (Factory/Product) | | |  |  |  |
| Corum | Kardex | 90.000 |  |  |  |
|  | Annex | 100.000 |  |  |  |
|  | Babax | 80.000 |  |  |  |
| Istanbul | Kardex | 75.000 |  |  |  |
|  | Annex | 65.000 |  |  |  |
|  | Babax | 90.000 |  |  |  |
|  |  |  |  |  |  |
| Demands (Tech market/Product) | | |  |  |  |
|  | Cevahir | Ankamall | Ninovapark | Piazza | Palm City |
| Kardex | 30.000 | 23.000 | 15.000 | 32.000 | 16.000 |
| Annex | 20.000 | 15.000 | 22.000 | 12.000 | 18.000 |
| Babax | 25.000 | 22.000 | 16.000 | 20.000 | 25.000 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***Cost of shipping ($ per product)*** | | |  |  |  |  |
|  |  | *Destinations* | | | |  |
|  |  | Trabzon | Antalya | Erzurum | Konya |  |
| Corum | Kardex | $0,50 | $0,50 | $1,00 | $0,20 |  |
|  | Annex | $1,00 | $0,75 | $1,25 | $1,25 |  |
|  | Babax | $0,75 | $1,25 | $1,00 | $0,80 |  |
| Istanbul | Kardex | $1,50 | $0,30 | $0,50 | $0,20 |  |
|  | Annex | $1,25 | $0,80 | $1,00 | $0,75 |  |
|  | Babax | $1,40 | $0,90 | $0,95 | $1,10 |  |
|  |  |  |  |  |  |  |
|  |  | Cevahir | Ankamall | Ninovapark | Piazza | Palm City |
| Corum | Kardex | $2,75 | $3,50 | $2,50 | $3,00 | $2,50 |
|  | Annex | $2,50 | $3,00 | $2,00 | $2,75 | $2,60 |
|  | Babax | $2,90 | $3,00 | $2,25 | $2,80 | $2,35 |
| Istanbul | Kardex | $3,00 | $3,50 | $3,50 | $2,50 | $2,00 |
|  | Annex | $2,25 | $2,95 | $2,20 | $2,50 | $2,10 |
|  | Babax | $2,45 | $2,75 | $2,35 | $2,85 | $2,45 |
|  |  |  |  |  |  |  |
|  |  | Cevahir | Ankamall | Ninovapark | Piazza | Palm City |
| Trabzon | Kardex | $1,50 | $0,80 | $0,50 | $1,50 | $3,00 |
|  | Annex | $1,00 | $0,90 | $1,20 | $1,30 | $2,10 |
|  | Babax | $1,25 | $0,70 | $1,10 | $0,80 | $1,60 |
| Antalya | Kardex | $1,00 | $0,50 | $0,50 | $1,00 | $0,50 |
|  | Annex | $1,25 | $1,00 | $1,00 | $0,90 | $1,50 |
|  | Babax | $1,10 | $1,10 | $0,90 | $1,40 | $1,75 |
| Erzurum | Kardex | $1,00 | $1,50 | $2,00 | $2,00 | $0,50 |
|  | Annex | $0,90 | $1,35 | $1,45 | $1,80 | $1,00 |
|  | Babax | $1,25 | $1,20 | $1,75 | $1,70 | $0,85 |
| Konya | Kardex | $2,50 | $1,50 | $0,60 | $1,50 | $0,50 |
|  | Annex | $1,75 | $1,30 | $0,70 | $1,25 | $1,10 |
|  | Babax | $1,50 | $1,10 | $1,50 | $1,10 | $0,90 |

1. (60 Points) Okmeydani Education and Research Hospital has a problem in its fluids analysis lab. The lab has available three machines that analyze various fluid samples. Recently, the demand for analyzing blood samples has increased so much that the lab director is having difficulty getting all the samples analyzed quickly enough and still completing the other fluid work that comes into the lab. The lab works with five types of blood specimens. Any machine can be used to process any of the specimens. However, the amount of time required by each machine varies depending on the type of specimen being analyzed. These times are summarized in the following table.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Specimen Type (Required Speciment Processing Time in Minutes )** | | | | |
| **Machine** | **1** | **2** | **3** | **4** | **5** |
| **A** | 3 | 4 | 4 | 5 | 3 |
| **B** | 5 | 3 | 5 | 4 | 5 |
| **C** | 2 | 5 | 3 | 3 | 4 |

Each machine can be used a total of 8 hours a day. Blood samples collected on a given day arrive at the lab and are stored overnight and processed the next day. So, at the beginning of each day, the lab director must determine how to allocate the various samples to the machines for analysis. This morning, the lab has 80 type-1 specimens, 75 type-2 specimens, 80 type-3 specimens, 120 type-4 specimens, and 60 type-5 specimens awaiting processing. The lab director wants to know how many of each type of specimen should be analyzed on each machine to minimize the total time that the machines are devoted to analyzing blood samples.

Create a spreadsheet model for this problem and solve it using Solver.

1. (50 Points)İTÜ Biomedical Engineering Graduate program has 11 master students and 6 teachers. Based on student transcripts student- teacher possible master thesis quality is calculated as below. The rules of the University are: one students can work only with one teacher, one teacher can have 3 students.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Teacher 1 | Teacher 2 | Teacher 3 | Teacher 4 | Teacher 5 | Teacher 6 |
| Student 1 | 23 | 22 | 89 | 78 | 43 | 63 |
| Student 2 | 60 | 74 | 45 | 48 | 80 | 61 |
| Student 3 | 41 | 25 | 48 | 20 | 47 | 79 |
| Student 4 | 67 | 64 | 67 | 32 | 28 | 40 |
| Student 5 | 59 | 56 | 80 | 73 | 41 | 81 |
| Student 6 | 42 | 66 | 81 | 20 | 90 | 25 |
| Student 7 | 28 | 91 | 56 | 82 | 64 | 31 |
| Student 8 | 74 | 58 | 72 | 63 | 89 | 56 |
| Student 9 | 77 | 40 | 70 | 49 | 90 | 40 |
| Student 10 | 74 | 56 | 81 | 24 | 78 | 81 |
| Student 11 | 91 | 90 | 75 | 51 | 47 | 64 |

Which student should be assigned to which teacher (Maximize total performance)? Solve the problem by using the solver.

1. (20 Points)

