**Exercise Problems III**

**Assignment Problem**

**Question 1**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Machine** | | | | | |
|  |  | M1 | M2 | M3 | M4 | M5 |
| **Job** | J1 | 11 | 7 | 10 | 17 | 10 |
| J2 | 13 | 21 | 7 | 11 | 13 |
| J3 | 13 | 13 | 15 | 13 | 14 |
| J4 | 18 | 10 | 13 | 16 | 14 |
| J5 | 12 | 8 | 16 | 19 | 10 |

**Question 2**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  | **Person** | | | |
|  |  | **P1** | **P2** | **P3** | **P4** |
| **Job** | **J1** | **5** | **9** | **3** | **6** |
| **J2** | **8** | **7** | **8** | **2** |
| **J3** | **6** | **10** | **12** | **7** |
| **J4** | **3** | **10** | **8** | **6** |

**Question 3**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Job**  **Person** | **1** | **2** | **3** | **4** |
| **A** | 7 | 5 | 8 | 4 |
| **B** | 5 | 6 | 7 | 4 |
| **C** | 8 | 7 | 9 | 8 |

**Question 4.**

Five bidders A, B, C, D, E have bid for five assets 1 to 5. The figures given below are the bids of

the bidders in lakhs of rupees:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Asset 1 | Asset 2 | Asset 3 | Asset 4 | Asset 5 |
| Bidder A | 7 | 9 | 2 | 6 | 7 |
| Bidder B | 6 | - | 5 | 6 | 6 |
| Bidder C | 9 | 4 | 7 | 10 | 3 |
| Bidder D | 2 | 5 | 4 | 2 | 1 |
| Bidder E | 9 | 6 | 2 | 4 | 6 |

a) Solve the assignment problem by maximizing the revenue through optimal assignment of

assets to bidders. Bidder B, however, does not want Asset 2.

b) An additional constraint is now added that Bidder E cannot be assigned Asset 1. Will there

be any change in the assignment? If so, find the new assignment pattern and the total

revenue.

**Question 5.**

IIT has decided to allot 5 special rooms to the toppers of 5 departments in separate halls. Each hall has its own advantage and disadvantage. Some halls are closer to department, some are near to market, some has good night canteen facility etc. Each of the five toppers were asked to rank their hall preferences amongst the halls RK, RP, Azad, LBS and VS. Their choices were recorded in a table as shown below. Most of the students have not filled their complete choices and ignored some of the halls as they are not satisfied with them. Assuming that their preferences can be quantified by ranks, find out which topper should be assigned to which hall.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Responses** | | | | | |
| **Halls** | **Topper ISE** | **Topper Mech** | **Topper CSE** | **Topper EE** | **Topper CE** |
| RK | RK | RP | RK | Azad |
| RP | LBS | Azad | VS | RK |
| LBS | VS | LBS | LBS | LBS |
|  | Azad | VS | RP |  |
|  |  | RK |  |  |

**Question 6.**

An automobile manufacturer has contracted to export 400 cars of model A and 500 cars of model B overseas. The model A car occupies a volume of 12 cubic meters, and the model B car occupies a volume of 15 cubic meters. Three ships for transporting the automobiles are available. They arrive at the port of destination at the beginning of January, the middle of February, and the end of March respectively. The first ship only transports model A cars at Rs. 9000 per automobile. The second and third ships transport both types at a cost of Rs. 700 and Rs. 800 per cubic meter respectively. The first ship can only accommodate 200 cars, and the second and third ships have available volumes of 4500 and 6000 cubic meters. If the manufacturer has contracted to deliver at least 250 and 200 cars of model A and B by the middle of February and the remainder by the end of March, what is the shipping pattern that minimizes the total cost? Formulate the LP problem and solve.