**Question 2**

**Part a**

Priority List:

|  |  |  |
| --- | --- | --- |
| **Priority List** | | |
| **Unit** | **Loading Limits (MW)** | |
|  |
| **No** | **Min** | **Max** |
| **1** | **50** | **200** |
| **1+3** | **65** | **260** |
| **1+3+2** | **80** | **310** |
| **1+3+2+4** | **85** | **350** |
| **1+3+2+4+5** | **90** | **390** |
|  |  |  |

This list gives an idea about selecting the possible states for a load level. Based on the priority list;

250 MW requires 4 states,

320 MW requires 2 states,

110 MW requires 5 states,

350 MW requires 2 states.

When the cost functions of each generators are investigated, there is no square of the power, resulting in constant incremental costs. Therefore, for a given state, load can be shared by considering its incremental cost values i.e. bi values. Therefore, for a given state, first generator should be at maximum power generation limit meanwhile the rest of them is at minimum limit.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **PL (MW)** | **Feasible states** | **P1** | **P2 (MW)** | **P3 (MW)** | **P4 (MW)** | **P5 (MW)** | **F1 ($/hr)** | **F2 ($/hr)** | **F3 ($/hr)** | **F4 ($/hr)** | **F5 ($/hr)** | **Ftotal ($)** |
| **(MW)** |
| **250** | 10100 | 200 |  | 50 |  |  | 3068 |  | 817 |  |  | 3885 |
| 11100 | 200 | 15 | 35 |  |  | 3068 | 310,5 | 605,5 |  |  | 3984 |
| 11110 | 200 | 15 | 30 | 5 |  | 3068 | 310,5 | 535 | 139,5 |  | 4053 |
| 11111 | 200 | 15 | 25 | 5 | 5 | 3068 | 310,5 | 464,5 | 139,5 | 135 | 4117,5 |
| **320** | 11110 | 200 | 50 | 60 | 10 |  | 3068 | 839 | 958 | 223 |  | 5088 |
| 11111 | 200 | 50 | 60 | 5 | 5 | 3068 | 839 | 958 | 139,5 | 135 | 5139,5 |
| **110** | 10000 | 110 |  |  |  |  | 1826 |  |  |  |  | 1826 |
| 10100 | 95 |  | 15 |  |  | 1619 |  | 323,5 |  |  | 1942,5 |
| 11100 | 80 | 15 | 15 |  |  | 1412 | 310,5 | 323,5 |  |  | 2046 |
| 11110 | 75 | 15 | 15 | 5 |  | 1343 | 310,5 | 323,5 | 139,5 |  | 2116,5 |
| 11111 | 70 | 15 | 15 | 5 | 5 | 1274 | 310,5 | 323,5 | 139,5 | 135 | 2182,5 |
| **350** | 11110 | 200 | 50 | 60 | 40 |  | 3068 | 839 | 958 | 724 |  | 5589 |
| 11111 | 200 | 50 | 60 | 35 | 5 | 3068 | 839 | 958 | 640,5 | 135 | 5640,5 |