|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| OPERATION TIME | Task 1 | Task 2 | Task 3 | Task 4 | Task 5 |
| ROBOT 1 | 56 | 68 | 82 | 94 | --- |
| ROBOT 2 | 76 | --- | 93 | --- | 90 |
| ROBOT 3 | 102 | 111 | 78 | --- | --- |
| COBOT 1 (ROBOT1 + HUMAN) | 48 | 70 | 71 | 48 | 74 |
| COBOT 2 (ROBOT2 + HUMAN) | 67 | 76 | 85 | 80 | 60 |
| COBOT 3 (ROBOT3 + HUMAN) | 74 | 62 | 68 | 26 | 29 |
| HUMAN | --- | 117 | --- | 96 | 89 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| SETUP TIME | Task 1 | Task 2 | Task 3 | Task 4 | Task 5 |
| ROBOT 1 | 24 | 23 | 13 | 19 | 13 |
| ROBOT 2 | 18 | 23 | 19 | 21 | 21 |
| ROBOT 3 | 22 | 24 | 29 | 17 | 21 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ENERGY CONSUMPTION | ROBOT 1 | ROBOT 2 | ROBOT 3 | HUMAN |
| IN [Wh / MIN] |  |  |  |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| SEQUENCE DEPENDENT TIME FOR ROBOT – 1 | Task 1 | Task 2 | Task 3 | Task 4 | Task 5 |
| Task 1 | 7 | 7 | 8 | 5 | 8 |
| Task 2 | 8 | 8 | 7 | 6 | 7 |
| Task 3 | 6 | 10 | 8 | 6 | 9 |
| Task 4 | 5 | 10 | 5 | 10 | 10 |
| Task 5 | 5 | 7 | 10 | 6 | 5 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| SEQUENCE DEPENDENT TIME FOR ROBOT – 2 | Task 1 | Task 2 | Task 3 | Task 4 | Task 5 |
| Task 1 | 9 | 8 | 10 | 8 | 11 |
| Task 2 | 9 | 7 | 8 | 8 | 10 |
| Task 3 | 7 | 9 | 7 | 8 | 11 |
| Task 4 | 10 | 11 | 9 | 8 | 7 |
| Task 5 | 8 | 8 | 8 | 8 | 9 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| PRECEDENCE MATRIX | Task 1 | Task 2 | Task 3 | Task 4 | Task 5 |
| Task 1 | 0 | 1 | 1 | 0 | 0 |
| Task 2 | 0 | 0 | 0 | 1 | 0 |
| Task 3 | 0 | 0 | 0 | 0 | 1 |
| Task 4 | 0 | 0 | 0 | 0 | 1 |
| Task 5 | 0 | 0 | 0 | 0 | 0 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| SEQUENCE DEPENDENT TIME FOR ROBOT – 3 | Task 1 | Task 2 | Task 3 | Task 4 | Task 5 |
| Task 1 | 12 | 11 | 13 | 6 | 6 |
| Task 2 | 11 | 12 | 7 | 6 | 9 |
| Task 3 | 6 | 6 | 7 | 6 | 6 |
| Task 4 | 13 | 8 | 11 | 7 | 9 |
| Task 5 | 13 | 6 | 8 | 6 | 6 |

**DATA :**

ENTER NUMBER OF TASKS : 5

ENTER NUMBER OF TYPES OF ROBOTS : 3

ENTER THE PARAMETER a1 VALUE [0.0 - 1.0] : 0.25

ENTER THE PARAMETER a2 VALUE [0.0 - 1.0] : 0.10

ENTER THE PARAMETER a3 VALUE [0.0 - 1.0] : 0.5

ENTER THE PARAMETER a4 VALUE [0.0 - 1.0] : 0.3

LOWER BOUND FOR OPERATION TIME OF ROBOT TYPE 1 : 50

UPPER BOUND FOR OPERATION TIME OF ROBOT TYPE 1 : 100

LOWER BOUND FOR OPERATION TIME OF ROBOT TYPE 2 : 75

UPPER BOUND FOR OPERATION TIME OF ROBOT TYPE 2 : 110

LOWER BOUND FOR OPERATION TIME OF ROBOT TYPE 3 : 60

UPPER BOUND FOR OPERATION TIME OF ROBOT TYPE 3 : 130

======================PRINTING ALL DATA======================

NUMBER OF TASKS : 5

NUMBER OF TYPES OF ROBOTS (NUMBER OF WORKSTATIONS) : 3

DATA FOR ROBOT TYPE 1:

LOWER BOUND FOR OPERATION TIME : 50

UPPER BOUND FOR OPERATION TIME : 100

LOWER BOUND FOR SETUP TIME : 12

UPPER BOUND FOR SETUP TIME : 25

LOWER BOUND FOR SEQUNCE DEPENDENT TIME : 5

UPPER BOUND FOR SEQUENCE DEPENDENT TIME : 10

DATA FOR ROBOT TYPE 2:

LOWER BOUND FOR OPERATION TIME : 75

UPPER BOUND FOR OPERATION TIME : 110

LOWER BOUND FOR SETUP TIME : 18

UPPER BOUND FOR SETUP TIME : 27

LOWER BOUND FOR SEQUNCE DEPENDENT TIME : 7

UPPER BOUND FOR SEQUENCE DEPENDENT TIME : 11

DATA FOR ROBOT TYPE 3:

LOWER BOUND FOR OPERATION TIME : 60

UPPER BOUND FOR OPERATION TIME : 130

LOWER BOUND FOR SETUP TIME : 15

UPPER BOUND FOR SETUP TIME : 32

LOWER BOUND FOR SEQUNCE DEPENDENT TIME : 6

UPPER BOUND FOR SEQUENCE DEPENDENT TIME : 13

DATA FOR COBOT TYPE 1 [ROBOT TYPE 1 + HUMAN WORKER]:

LOWER BOUND FOR OPERATION TIME : 25

UPPER BOUND FOR OPERATION TIME : 75

DATA FOR COBOT TYPE 2 [ROBOT TYPE 2 + HUMAN WORKER]:

LOWER BOUND FOR OPERATION TIME : 57

UPPER BOUND FOR OPERATION TIME : 92

DATA FOR COBOT TYPE 3 [ROBOT TYPE 3 + HUMAN WORKER]:

LOWER BOUND FOR OPERATION TIME : 25

UPPER BOUND FOR OPERATION TIME : 95

DATA FOR HUMAN WORKER:

LOWER BOUND FOR OPERATION TIME : 76

UPPER BOUND FOR OPERATION TIME : 128