**Question 2 [12 marks]:**

A factory produces custom widgets according to customer requirements. It has several orders, each for a single widget. For each order, we know the following information:

 i) The profit that the factory will make from the order.

ii) The deadline – the last day on which the customer will accept delivery.

 The factory can make exactly one widget per day. The following table shows all the orders for a 6-day period:

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Order No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Profit | 10 | 20 | 90 | 40 | 50 | 100 | 70 | 80 | 30 | 60 |
| Deadline | 6 | 6 | 1 | 3 | 4 | 1 | 2 | 4 | 3 | 4 |

Use the Greedy Approach to determine the orders that the factory should accept for achieving the highest profit, and the schedule for producing the widgets of the accepted orders.

Firstly I would sort the order based on profit in a descending order

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Order No. | 6 | 3 | 7 | 8 | 10 | 5 | 4 | 9 | 2 | 1 |
| Profit | 100 | 90 | 70 | 80 | 60 | 50 | 40 | 30 | 20 | 10 |
| Deadline | 1 | 1 | 2 | 4 | 4 | 4 | 3 | 3 | 6 | 6 |

Now we will iterate through the table and take the highest profit and schedule them as late as possible

First we will take Order No. 6 and put it as late as possible, which is day 1

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Day | 1 | 2 | 3 | 4 | 5 | 6 |
| Order No. | 6 |  |  |  |  |  |
| Profit | 100 |  |  |  |  |  |
| Deadline | 1 |  |  |  |  |  |

As Order No. 3 expired in deadline, we will take Order No. 7

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Day | 1 | 2 | 3 | 4 | 5 | 6 |
| Order No. | 6 | 7 |  |  |  |  |
| Profit | 100 | 70 |  |  |  |  |
| Deadline | 1 | 2 |  |  |  |  |

Continuing we will take Order No. 8 and schedule it as late as possible which is day 4

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Day | 1 | 2 | 3 | 4 | 5 | 6 |
| Order No. | 6 | 7 |  | 8 |  |  |
| Profit | 100 | 70 |  | 80 |  |  |
| Deadline | 1 | 2 |  | 4 |  |  |

Continuing we will take Order No. 10 and schedule it as late as possible which is day 3

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Day | 1 | 2 | 3 | 4 | 5 | 6 |
| Order No. | 6 | 7 | 10 | 8 |  |  |
| Profit | 100 | 70 | 60 | 80 |  |  |
| Deadline | 1 | 2 | 4 | 4 |  |  |

Continuing we will take Order No. 2 and schedule it as late as possible which is day 6

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Day | 1 | 2 | 3 | 4 | 5 | 6 |
| Order No. | 6 | 7 | 10 | 8 |  | 2 |
| Profit | 100 | 70 | 60 | 80 |  | 20 |
| Deadline | 1 | 2 | 4 | 4 |  | 6 |

Continuing we will take Order No. 1 and schedule it as late as possible which is day 5

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Day | 1 | 2 | 3 | 4 | 5 | 6 |
| Order No. | 6 | 7 | 10 | 8 | 1 | 2 |
| Profit | 100 | 70 | 60 | 80 | 10 | 20 |
| Deadline | 1 | 2 | 4 | 4 | 6 | 6 |

So this would be the final answer Order No. [6, 7, 10, 8, 1, 2]