FORM KESEPAKATAN SOAL UJIAN ~~D3~~ / ~~Eks. D3 > S1~~ / S1 / ~~S2~~ (*)
Semester Genap / ~~Ganjil~~ (*) 2023/2024

Kode – Nama Dosen	**:**	D6839 — Franz Adeta Junior, S.T., M.Kom. D6824 — Panji Arisaputra, S.Kom, M.Kom. D6422 — Ajeng Wulandari, S.Kom., M.Kom.
Kode – Nama Mata kuliah	**:**	COMP6048001 — Data Structures
Durasi Ujian	**:**	**120 Minutes**
Sifat Ujian	**:**	~~Buka Buku~~ / Tutup Buku*
Buku Ujian	**:**	Tidak
Supporting Tools	**:**	-
Penggandaan *Supporting File*	**:**	Ya

Learning Outcomes :
LO 1: Explain the concept of data structures and its usage in Computer Science

LO 2: Illustrate any learned data structure and its usage in application

LO 3: Apply data structures using C

No	Tipe Soal (*) (Essay/Kasus)	Bobot (%)	LO Terkait	Topik/Materi yang Diujikan
1	Essay	30	LO1, LO2	Stack, Expression Tree
2	Essay	20	LO1, LO2	Hashing & Hash table
3	Case	50	LO3	Linked List, Queue

Keterangan: (*) coret atau pilih salah satu

Jakarta, 20 Februari 2024

Dibuat oleh,

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Dosen Pembuat Soal

Dicek oleh,

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Disetujui oleh,

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Academic Career: *Undergraduate / ~~Master~~ / ~~Doctoral~~ *)*			**Class Program:** *~~International~~ / Regular / ~~Smart Program~~ / ~~Global Class~~ / ~~BINUS Online Learning~~ *)*		
☑ **Mid Exam** ☐ **Compact Term Exam** ☐ **Final Exam** ☐ **Others Exam : ______________**			**Term : ~~Odd~~ / Even / ~~Compact~~ *)** **Period (Only for BOL) : ~~1~~ / ~~2~~ *)**		
☑ **Kemanggisan** ☐ **Senayan** ☐ **Semarang** ☐ **Alam Sutera** ☐ **Bandung** ☐ **Bekasi** ☐ **Malang**			**Academic Year :** **2023 / 2024**		
Exam Type*	:	Onsite / ~~Online~~	Faculty / Dept.	:	School of Computer Science
Day / Date**	:	Thursday, March 14th 2024	Code - Course	:	COMP6048001 — Data Structures
Time**	:	08.30 – 10.30 WIB (120 Minutes)	Code - Lecturer	:	D6839 — Franz Adeta Junior, S.T., M.Kom. D6824 — Panji Arisaputra, S.Kom, M.Kom. D6422 — Ajeng Wulandari, S.Kom., M.Kom.
Exam Specification***	:	☐ Open Book ☐ Open Notes ☑Close Book ☐ Submit Project ☐ Open E-Book ☐ Oral Test	BULC (Only for BOL)	:	-
			Class	:	11LA, 11LB, & 11LC (PPTI 17, 18, & 19)
Equipment***	:	☐ Exam Booklet ☐ Laptop ☐ Drawing Paper – A3 ☐ Calculator ☐ Tablet ☐ Drawing Paper – A2 ☐ Dictionary ☐ Smartphone ☐ Notes	Student ID ***	:	
			Name ***	:	
			Signature ***	:	
*) *Strikethrough the unnecessary items*		**) *For Online Exam, this is the due date*		***) *Only for Onsite Exam*	

Please insert the test paper into the exam booklet and submit both papers after the test.

The penalty for CHEATING is DROP OUT!

Learning Outcomes:

LO 1: Explain the concept of data structures and its usage in Computer Science

LO 2: Illustrate any learned data structure and its usage in application

LO 3: Apply data structures using C

I. Essay (50%)

1. **Stack and Expression Tree**

   a. **Applications of Stack**

      i. **[LO 1, LO 2, 10 points] Convert** 1 / 2 * (2 + (5 – 7) * 6) + 2 to **Prefix** Notation. Simulate it using Stack Algorithm.

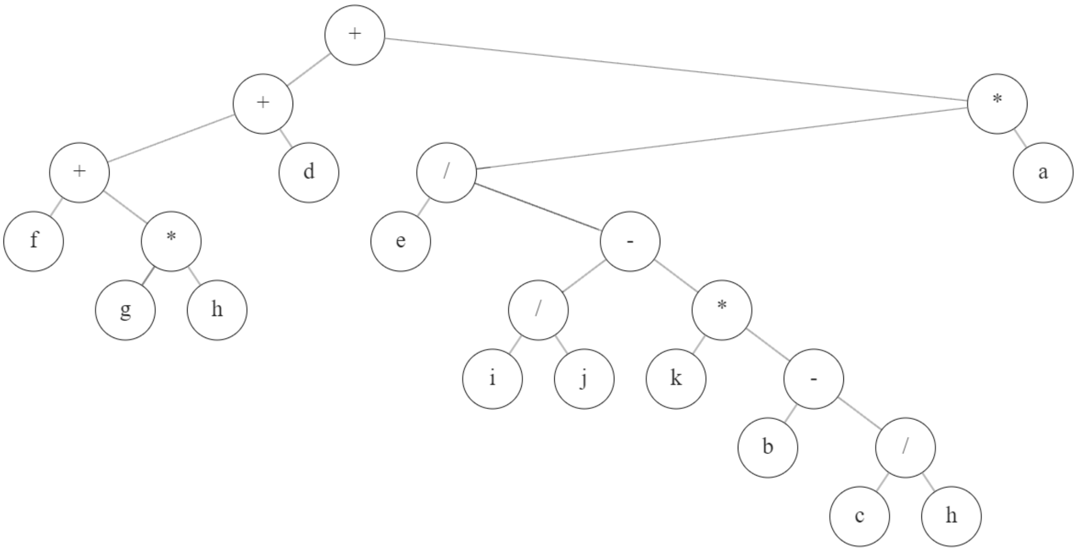
      ii. **[LO 1, LO 2, 10 points] Evaluate** this Postfix notation from No. 1 above. Simulate it using Stack Algorithm so the **calculation result** can be achieved.

   *Answer the question in Microsoft Excel. The file extension to be uploaded is .xlsx

   b. **Applications of Expression Tree**

      i. **[LO 1, LO 2, 5 points] Create** the **Expression Tree** from No. 1 in Application of Stack above.

      ii. **[LO 1, LO 2, 5 points] Create** the **Inorder**, **Preorder**, and **Postorder** from the Expression Tree below:



   *Answer the question in Microsoft Word. The file extension to be uploaded is .docx

2. **[LO1, LO2, 20 points] Applications of Hashing & Hash table**

Gomu Fruit company wants to do data management using hash table. The company is the largest fruit distributor in the east blue and asks you to be a programmer for their data storage system. During your discussion with the company's team, the IT head divisions asks you to create a hash table with the following criteria:

The hash function used to enter data in the hash table with 3 stages:

- Stage 1: Sum all decimal values of characters.
- Stage 2: extract the last 2 digits of the number.
- Stage 3: modulo with the table size.

Meanwhile, to overcome data collision, the chaining technique is used so that the data remains in the proper index. Give a simulation of storing data with the hash function criteria described to produce an index in the hash table!

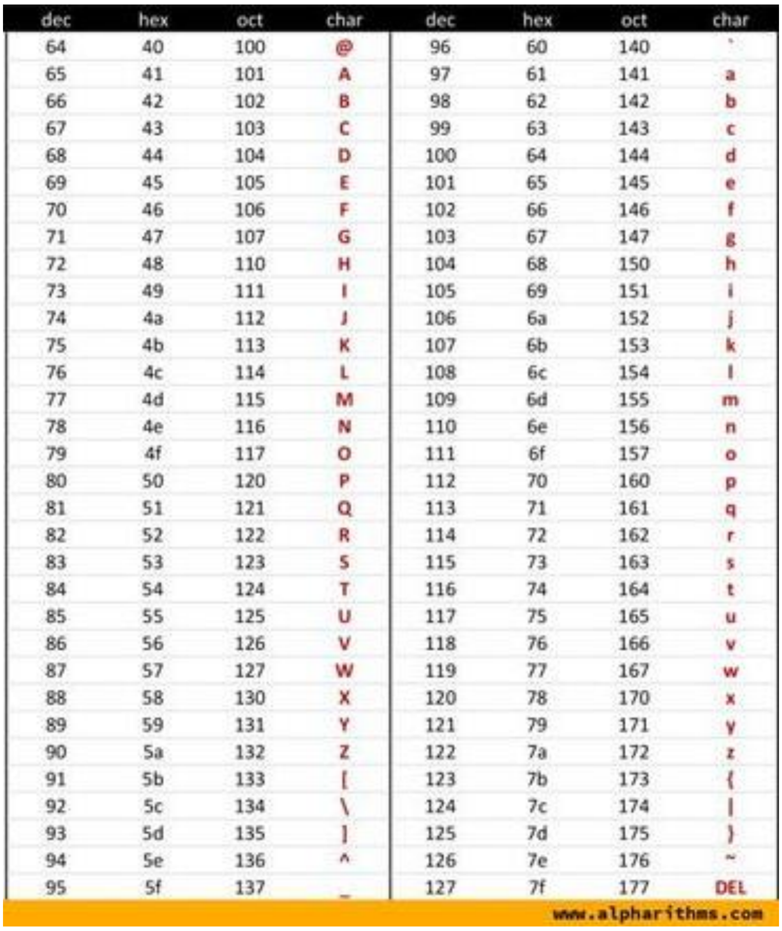
Notes:

- *The maximum length of the hash table is 100*
- *For reference, the character 'a' has a decimal value of 97*

The following are the key-value pairs that must be entered in the hash table:

1. guava-56
2. mango-23
3. orange-23
4. kiwi-53

Key indicates the type of fruit and value is the quantity of the fruit. Here's an ASCII table to help.



dec	hex	oct	char	dec	hex	oct	char
64	40	100	@	96	60	140	`
65	41	101	A	97	61	141	a
66	42	102	B	98	62	142	b
67	43	103	C	99	63	143	c
68	44	104	D	100	64	144	d
69	45	105	E	101	65	145	e
70	46	106	F	102	66	146	f
71	47	107	G	103	67	147	g
72	48	110	H	104	68	150	h
73	49	111	I	105	69	151	i
74	4a	112	J	106	6a	152	j
75	4b	113	K	107	6b	153	k
76	4c	114	L	108	6c	154	l
77	4d	115	M	109	6d	155	m
78	4e	116	N	110	6e	156	n
79	4f	117	O	111	6f	157	o
80	50	120	P	112	70	160	p
81	51	121	Q	113	71	161	q
82	52	122	R	114	72	162	r
83	53	123	S	115	73	163	s
84	54	124	T	116	74	164	t
85	55	125	U	117	75	165	u
86	56	126	V	118	76	166	v
87	57	127	W	119	77	167	w
88	58	130	X	120	78	170	x
89	59	131	Y	121	79	171	y
90	5a	132	Z	122	7a	172	z
91	5b	133	[	123	7b	173	{
92	5c	134	\	124	7c	174	|
93	5d	135	]	125	7d	175	}
94	5e	136	^	126	7e	176	~
95	5f	137	_	127	7f	177	DEL

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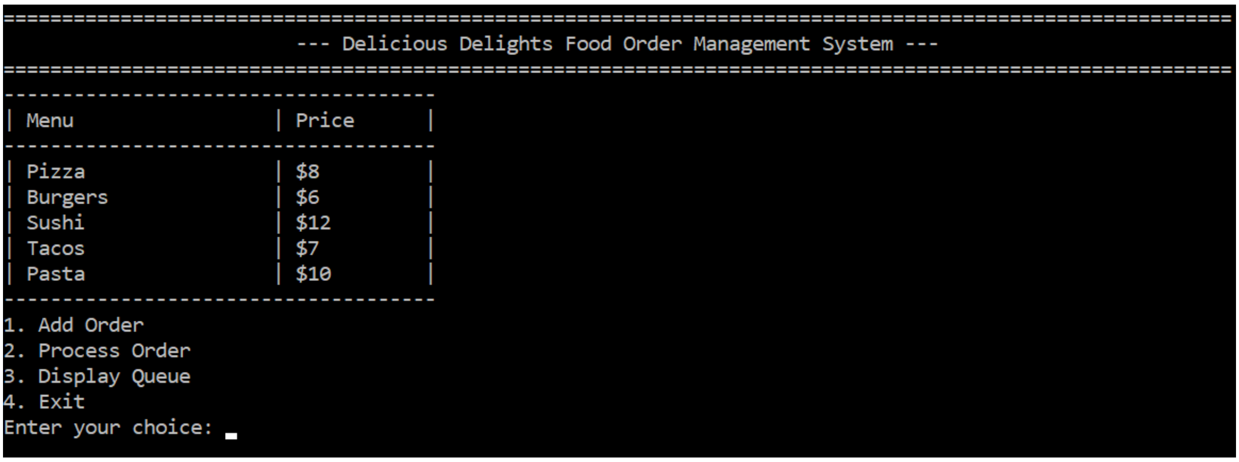
*Answer the question in Microsoft Word. The file extension to be uploaded is .docx

II. Case (50%)

1. **[LO3, 50 points] Applications of Linked List and Queue**

Delicious Delights is a cozy catering company nestled in the heart of the town. However, as the business grows, managing orders has become a bit chaotic. There are times when orders get mixed up, resulting in some customers receiving their food late or, worse, receiving the wrong order altogether. Sarah, the owner of Delicious Delights, realizes that they need a better system to manage their orders. Sarah recruit you to make the system they envision should allow customers to place orders seamlessly, prioritize urgent requests, calculate costs accurately, and handle cancellations efficiently.

Your system will implement **priority queue** concept using a **single linked list**. If the order list is still empty, the first customer order will be placed in the first queue list. All food orders list is sorted descending based on user's urgency level order. If there are two or more orders with the same urgency level, the latest order will be listed after the prior order. The system will proceed with the order based on the FIFO – the first order on the list, will be the first one to proceed. The system also allows us to view the list of orders and cancel them, which means the system removes the order from the queue.

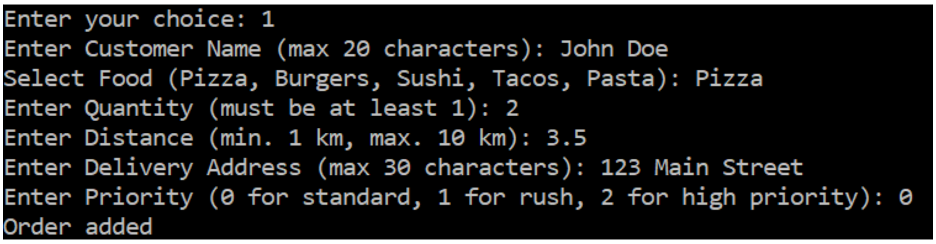


```
==============================================================================================================
                         --- Delicious Delights Food Order Management System ---
==============================================================================================================
--------------------------------------
| Menu                   | Price      |
--------------------------------------
| Pizza                  | $8         |
| Burgers                | $6         |
| Sushi                  | $12        |
| Tacos                  | $7         |
| Pasta                  | $10        |
--------------------------------------
1. Add Order
2. Process Order
3. Display Queue
4. Exit
Enter your choice: _
```

Figure 1 Main Menu

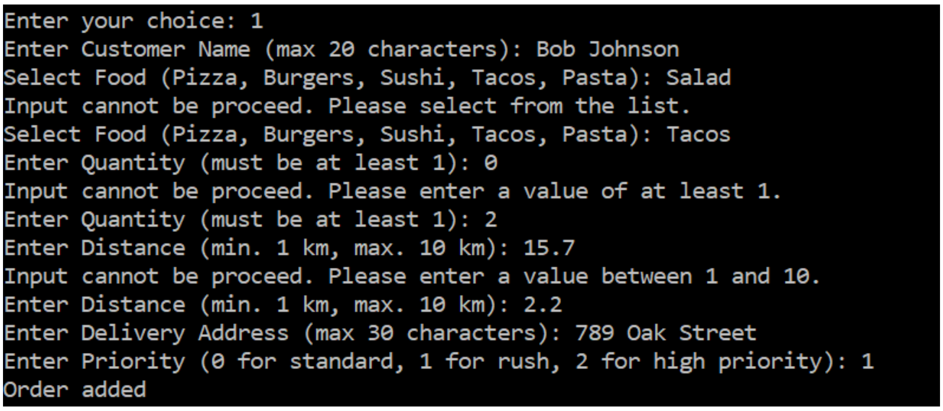
Menu:

1. Add Order:
   - Users should be able to input details such as customer name, food type, quantity, delivery address, and priority level (0 for standard, 1 for rush, 2 for high priority – higher number means higher urgency).
   - Implement proper input validation for user inputs, such as food type selection, priority level, and distance.
   - Ensure that the quantity entered by the user is not less than 1.
   - Prompt the user to input the distance (in km) for the delivery, which should not exceed 10 km.
   - Display appropriate error messages if the user enters invalid inputs.
   - Ensure that the system handles edge cases gracefully and prevents runtime errors.



```
Enter your choice: 1
Enter Customer Name (max 20 characters): John Doe
Select Food (Pizza, Burgers, Sushi, Tacos, Pasta): Pizza
Enter Quantity (must be at least 1): 2
Enter Distance (min. 1 km, max. 10 km): 3.5
Enter Delivery Address (max 30 characters): 123 Main Street
Enter Priority (0 for standard, 1 for rush, 2 for high priority): 0
Order added
```

Figure 2 Input User Order Details

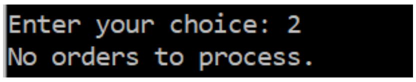


```
Enter your choice: 1
Enter Customer Name (max 20 characters): Bob Johnson
Select Food (Pizza, Burgers, Sushi, Tacos, Pasta): Salad
Input cannot be proceed. Please select from the list.
Select Food (Pizza, Burgers, Sushi, Tacos, Pasta): Tacos
Enter Quantity (must be at least 1): 0
Input cannot be proceed. Please enter a value of at least 1.
Enter Quantity (must be at least 1): 2
Enter Distance (min. 1 km, max. 10 km): 15.7
Input cannot be proceed. Please enter a value between 1 and 10.
Enter Distance (min. 1 km, max. 10 km): 2.2
Enter Delivery Address (max 30 characters): 789 Oak Street
Enter Priority (0 for standard, 1 for rush, 2 for high priority): 1
Order added
```

Figure 3 Handling Invalid User Input

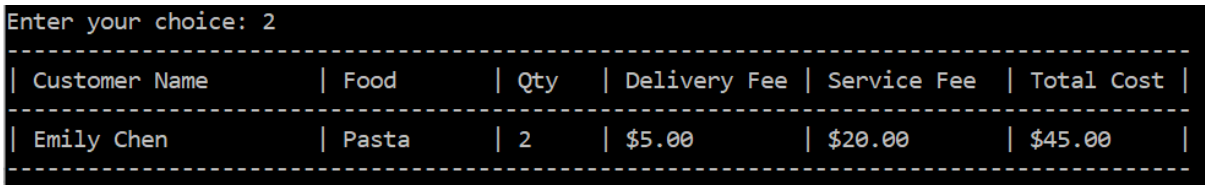
2. Process Order:
   - Orders should be prioritized based on their urgency level (priority).
   - Process the first order in the queue and calculate the total cost, including delivery fees and food costs.
   - Delivery fee is depends on customer distance to the company.
     - $2.5 for 1.0-5.0 km distance and $5.0 for 5.1-10 km
   - There are additional service fee for urgency
     - Additional service fee $10.0 for rush and $20.0 for high priority

- ○ Display the details of the processed order, including food name, quantity, delivery fee, service fee and total cost.
- ○ After the order proceeds, it will be removed from the order queue list.
- ○ Ensure that the system handles no orders to process scenario gracefully.



```
Enter your choice: 2
No orders to process.
```

Figure 4 When there isn't order to proceess.

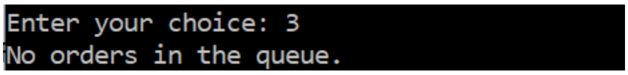


```
Enter your choice: 2
-----------------------------------------------------------------------------------
| Customer Name          | Food         | Qty     | Delivery Fee | Service Fee    | Total Cost |
-----------------------------------------------------------------------------------
| Emily Chen             | Pasta        | 2       | $5.00        | $20.00         | $45.00     |
-----------------------------------------------------------------------------------
```

Figure 5 Process the first queue order and show the details.

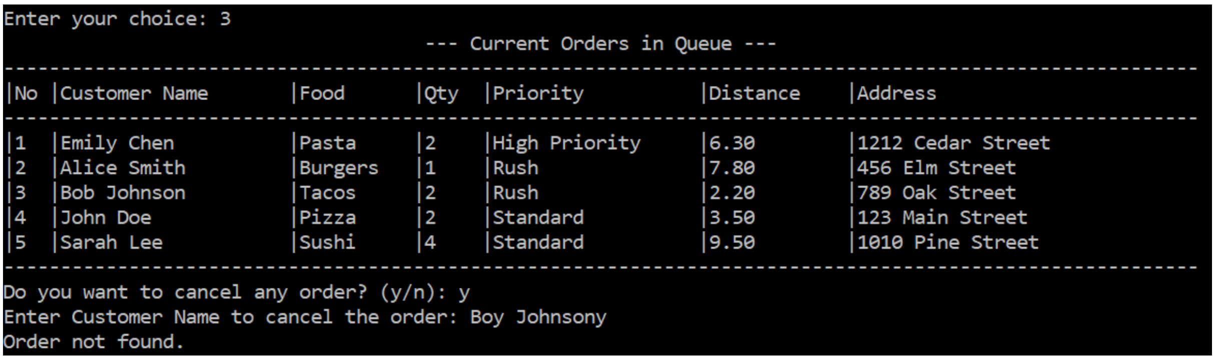
3. Display Queue:

- ○ Display the current orders in the queue along with their details.
- ○ Prompt the user if they want to cancel any order.
- ○ If the user chooses to cancel an order, ensure the system allows them to enter the customer's name for the order to be canceled.
- ○ Remove the canceled order from the queue and display a confirmation message.
- ○ Ensure that the system handles no queue scenario gracefully.



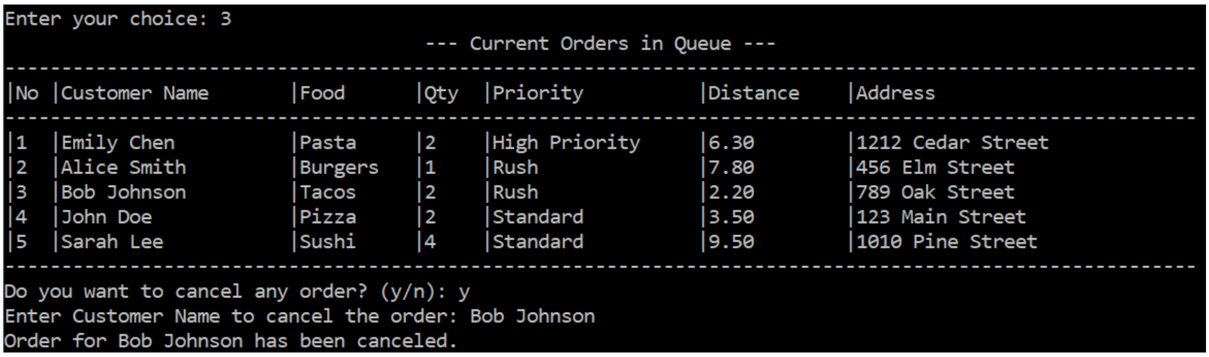
```
Enter your choice: 3
No orders in the queue.
```

Figure 6 When there isn't order in the system.



```
Enter your choice: 3
                                    --- Current Orders in Queue ---
------------------------------------------------------------------------------------------------------
|No |Customer Name        |Food       |Qty  |Priority          |Distance    |Address
------------------------------------------------------------------------------------------------------
|1  |Emily Chen           |Pasta      |2    |High Priority     |6.30        |1212 Cedar Street
|2  |Alice Smith          |Burgers    |1    |Rush              |7.80        |456 Elm Street
|3  |Bob Johnson          |Tacos      |2    |Rush              |2.20        |789 Oak Street
|4  |John Doe             |Pizza      |2    |Standard          |3.50        |123 Main Street
|5  |Sarah Lee            |Sushi      |4    |Standard          |9.50        |1010 Pine Street
------------------------------------------------------------------------------------------------------
Do you want to cancel any order? (y/n): y
Enter Customer Name to cancel the order: Boy Johnsony
Order not found.
```

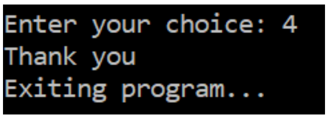
Figure 7 Showing queue order and search customer who wants to cancel their order.



```
Enter your choice: 3
                                     --- Current Orders in Queue ---
---------------------------------------------------------------------------------------------------------
|No |Customer Name        |Food      |Qty  |Priority          |Distance    |Address
---------------------------------------------------------------------------------------------------------
|1  |Emily Chen           |Pasta     |2    |High Priority     |6.30        |1212 Cedar Street
|2  |Alice Smith          |Burgers   |1    |Rush              |7.80        |456 Elm Street
|3  |Bob Johnson          |Tacos     |2    |Rush              |2.20        |789 Oak Street
|4  |John Doe             |Pizza     |2    |Standard          |3.50        |123 Main Street
|5  |Sarah Lee            |Sushi     |4    |Standard          |9.50        |1010 Pine Street
---------------------------------------------------------------------------------------------------------
Do you want to cancel any order? (y/n): y
Enter Customer Name to cancel the order: Bob Johnson
Order for Bob Johnson has been canceled.
```

Figure 8 Showing queue order and search customer who wants to cancel their order.

4. Exit
   - Remove reminding order in queue.
   - User can exit from application.



```
Enter your choice: 4
Thank you
Exiting program...
```

Figure 9 Exit the program

-- Good Luck --