FEYZI CAN ESER – BRIEF EXPLANATION OF PROGRAM

- Deliverable: A Priority Queue for managing flight details using a linked list.
- I implemented all the methods suggested one by one, fixing implementation errors by testing via the code in main.c
- **Key Elements Used**:
  - **While Loops**: Traverse the queue until we reach the end node
    - Used for adding elements, printing, maintaining priority, counting, etc. in most methods
    - Not using for loops since the length of the queue is variable
  - **If-Statements**: To check for invalid inputs when creating new flights, compare priority, compare flight characteristics, and, crucially to check which is the last node (i.e., if it points to Null) so we can stop our while loop
    - Initialize(): Return null if there is insufficient memory
    - Add() : Check for invalid flight numbers and priorities, determine the correct place to insert a new flight by comparing priorities
    - All Count..() methods: Check if a given flight matches the desired flight property
  - **Malloc**: Dynamic memory allocation used when creating new nodes, which are freed upon deletion

IMPORTANT TESTS I

In this and the next slide you can see the output of sample code I have written to cover all specified test cases in the pdf, in addition to passing the auto grader test.

Counting operations on empty queue always returns 0

```
// Try counting on empty queue
printf("\n\nCounting operations on empty queue\n\n");
mypq = Initialize();
printf("Number of flights: %d\n",Count(mypq));
printf("Number of Southwest flights: %d\n",CountAirline(mypq,'S'));
printf("Number of Delta flights: %d\n",CountAirline(mypq,'D'));
printf("Number of American flights: %d\n",CountAirline(mypq,'A'));
printf("Number of United flights: %d\n",CountAirline(mypq,'U'));
flighttest = 700;
printf("Number of flight numbers smaller/larger than %d: %d, %d\n",flighttest,
CountSmaller(mypq,flighttest),CountLarger(mypq,flighttest));
mypriority = 1200;
printf("Number of flights earlier/later than %d: %d, %d\n",mypriority,
CountEarlier(mypq,mypriority),CountLater(mypq,mypriority));
```

```
Counting operations on empty queue

Number of flights: 0
Number of Southwest flights: 0
Number of Delta flights: 0
Number of American flights: 0
Number of United flights: 0
Number of flight numbers smaller/larger than 700: 0, 0
Number of flights earlier/later than 1200: 0, 0
```

IMPORTANT TESTS II

```
// Initialize queue, delete from empty, count items
mypq = Initialize();
Remove(mypq);
Print(mypq);
printf("Number of flights: %d\n",Count(mypq));
// Add 10 flights, 2 of which are invalid
returnval = 0;
returnval = Add(mypq, 'S', 1402, 2317);
returnval = Add(mypq, 'C', 70, 1043);
returnval = Add(mypq, 'U', 201, 500);
returnval = Add(mypq, 'A', 1402, -2317);
if(returnval == -1) printf("Error adding to pq\n");
returnval = Add(mypq, 'C', -70, 1023);
if(returnval == -1) printf("Error adding to pq\n");
returnval = Add(mypq, 'S', 201, 20);
returnval = Add(mypq, 'A', 1691, 1602);
// Print queue
Print(mypq);
// Compute statistics
printf("Number of flights: %d\n",Count(mypq));
printf("Number of Southwest flights: %d\n",CountAirline(mypq,'S'));
printf("Number of Delta flights: %d\n",CountAirline(mypq,'D'));
printf("Number of American flights: %d\n",CountAirline(mypq,'A'));
printf("Number of United flights: %d\n",CountAirline(mypq,'U'));
flighttest = 700;
printf("Number of flight numbers smaller/larger than %d: %d, %d\n",flighttest,
    CountSmaller(mypq,flighttest),CountLarger(mypq,flighttest));
mypriority = 1200;
printf("Number of flights earlier/later than %d: %d, %d\n",mypriority,
    CountEarlier(mypq,mypriority),CountLater(mypq,mypriority));
// Delete 4, print
printf("\nDeleting 2 flights, print\n");
Remove(mypq); Remove(mypq);
Print(mypq);
// Delete 4, print
printf("\n Delete 4 flights, print\n");
Remove(mypq); Remove(mypq); Remove(mypq); Remove(mypq);
```

Cant remove from empty queue

Does not print anything for empty queue

Cant add flight with negative priority

Cant add flight with negative flight no

All counting operations are accurate

Again see that the deletion operation stops once the queue is empty

```
Custom tests

Priority queue contents:
Number of flights: 0
Error adding to pq
Error adding to pq
Priority queue contents:
S 201 20
U 201 500
C 70 1043
A 1691 1602
S 1402 2317
Number of flights: 5
Number of Southwest flights: 2
Number of Delta flights: 0
Number of American flights: 1
Number of United flights: 1
Number of flight numbers smaller/larger than 700: 3, 2
Number of flights earlier/later than 1200: 3, 2

Deleting 2 flights, print
Priority queue contents:
C 70 1043
A 1691 1602
S 1402 2317

Delete 4 flights, print
Priority queue contents:
```