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**Input:**

#include <iostream>

#include <string>

#include <vector>

#include <iomanip>

#include <cctype>

#include <limits>

#include <algorithm>

using namespace std;

// Constants

const int NUM\_SEATS = 50;

const int FIRST\_CLASS\_ROWS = 4;

const double ECONOMY\_COST = 1600.00;

const double FIRST\_CLASS\_MULTIPLIER = 1.20;

const int TICKET\_WIDTH = 60; // Define a constant for ticket width

// Flight structure to hold flight details

struct Flight {

string departureTime;

vector<bool> seats;

int bookings;

Flight(string time) : departureTime(time), seats(NUM\_SEATS, false), bookings(0) {}

};

// Booking structure to hold each booking’s details

struct Booking {

string fullName;

int flightIndex;

int seatNumber;

};

// Function to display banner

void displayBanner(const string& title, int width) {

string border(width, '\*');

cout << border << endl;

cout << "\*" << string(width - 2, ' ') << "\*" << endl;

// Calculate centering

int padding = (width - 2 - title.length()) / 2;

string paddedTitle = string(padding, ' ') + title + string(padding, ' ');

// Adjust if odd length

if ((width - 2 - title.length()) % 2 != 0) {

paddedTitle += " ";

}

cout << "\*" << paddedTitle << "\*" << endl;

cout << "\*" << string(width - 2, ' ') << "\*" << endl;

cout << border << endl;

}

// Function to print banner

void printAsterisks(int count) {

for (int i = 0; i < count; ++i) {

cout << "\*";

}

cout << endl;

}

void displayTicketBanner() {

printAsterisks(TICKET\_WIDTH);

cout << "Travel ticket for FLIGHT" << endl;

printAsterisks(TICKET\_WIDTH);

}

void displayTicketBanner2(double ticketPrice) {

printAsterisks(TICKET\_WIDTH);

cout << "Amount: R" << ticketPrice << " Thank you for booking with COS1511. "

<< "\nYour travel agent for this query is Hussein Madan" << endl;

printAsterisks(TICKET\_WIDTH);

}

// Function to print a line of dashes of given length

void printDashLine(int length) {

for (int i = 0; i < length; ++i) {

cout << "-";

}

cout << "\n";

}

// Function prototypes

void displayMenu(const vector<Flight>& flights);

void displaySeating(const Flight& flight);

int getSeatNumber(const Flight& flight);

void bookSeat(Flight& flight, int seatNumber);

void displayBookingTicket(const string& fullName, const Flight& flight,

int seatNumber);

void displayBookingSummary(const vector<Flight>& flights,

const vector<Booking>& bookings);

// Function to validate name

bool isValidName(const string& name) {

return all\_of(name.begin(), name.end(), [](char c) {

return isalpha(c) || isspace(c);

});

}

int main() {

// Initialize flight times

vector<Flight> flights;

flights.push\_back(Flight("07:00"));

flights.push\_back(Flight("09:00"));

flights.push\_back(Flight("11:00"));

flights.push\_back(Flight("13:00"));

flights.push\_back(Flight("15:00"));

vector<Booking> bookings; // Store all bookings

string fullName;

char continueBooking;

displayBanner("Welcome to COS1511 Flight Booking System", 50);

do {

cout << "Enter full name: ";

getline(cin, fullName);

if (fullName.empty()) {

cout << "Full name cannot be empty. Please try again.\n";

} else if (!isValidName(fullName)) {

cout << "Invalid name! Please enter only letters"

<< " and spaces.\n";

} else {

break; // Exit the loop if the name is valid

}

} while (true);

do {

displayMenu(flights);

int choice;

while (true) {

cout << "Choose the time by entering the option number"

<< " from the displayed list (1-5): ";

cin >> choice;

if (cin.fail() || choice < 1 || choice > 5) {

cin.clear();

cin.ignore(numeric\_limits<streamsize>::max(), '\n');

cout << "Incorrect option! Please choose from"

<< " 1-5.\n" << endl;

} else {

cin.ignore(numeric\_limits<streamsize>::max(), '\n');

break;

}

}

// Validate input range 1-5

while (choice < 1 || choice > 5) {

cout << "Incorrect option! Please choose from 1-5: ";

cin >> choice;

}

Flight& selectedFlight = flights[choice - 1];

displaySeating(selectedFlight);

int seatNumber = getSeatNumber(selectedFlight);

bookSeat(selectedFlight, seatNumber);

displayBookingTicket(fullName, selectedFlight, seatNumber);

selectedFlight.bookings++;

// Store booking details

Booking newBooking;

newBooking.fullName = fullName;

newBooking.flightIndex = choice - 1;

newBooking.seatNumber = seatNumber;

bookings.push\_back(newBooking);

cout << "Do you want to make another booking? (Y/N): ";

cin >> continueBooking;

cin.ignore(numeric\_limits<streamsize>::max(), '\n');

if (toupper(continueBooking) == 'Y') {

do {

cout << "Enter full name: ";

getline(cin, fullName);

if (fullName.empty()) {

cout << "Full name cannot be empty. Please try again.\n";

} else if (!isValidName(fullName)) {

cout << "Invalid name! Please enter only letters"

<< " and spaces.\n";

} else {

break; // Exit the loop if the name is valid

}

} while (true);

}

} while (toupper(continueBooking) == 'Y');

displayBookingSummary(flights, bookings);

cout << "\nThank you for using the COS1511 Flight Booking System!\n";

return 0;

}

// Function to display the flight menu

void displayMenu(const vector<Flight>& flights) {

cout << "\nThe available travel times for flights are:\n";

cout << left << setw(10) << "Option" << setw(10) << "Depart" << setw(10)

<< "Arrive" << endl;

printDashLine(30);

for (size\_t i = 0; i < flights.size(); ++i) {

int departureHour = stoi(flights[i].departureTime.substr(0, 2));

int arrivalHour = (departureHour + 2) % 24;

string arrivalTime = (arrivalHour < 10 ? "0" : "") + to\_string(arrivalHour) + ":30";

cout << left << setw(10) << ("[" + to\_string(i + 1) + "]") << setw(10)

<< flights[i].departureTime << setw(10) << arrivalTime << endl;

}

}

// Function to display the seating arrangement

**void** displaySeating(**const** Flight& flight) { cout << "\nThe available seats for " << flight.departureTime << " are as follows:\n\n"; char rowLabel = 'A';

for (int i = 0; i < NUM\_SEATS; ++i) {

// Show section labels

if (i == 0) {

cout << "First Class (R1920.00):\n";

}

if (i == 18) {

cout << "\n Economy Class (R1600.00):\n";

}

int seatInRow = i % 6;

string seatLabel = string(1, rowLabel) + to\_string(seatInRow + 1);

cout << " | " << (flight.seats[i] ? "\*\*" : seatLabel);

// Aisle separator after seat 3

if (seatInRow == 3) {

cout << " | ------ ";

}

// End of row OR last seat in the array

if (seatInRow == 5 || i == NUM\_SEATS - 1) {

cout << " |\n";

rowLabel++;

}

}

}

// Function to get the seat number from the user

int getSeatNumber(const Flight& flight) {

string seatInput;

bool validSeat = false;

int seatNumber = 0;

while (!validSeat) {

// Check if any seat is booked

bool anyBooked = false;

for (bool booked : flight.seats) {

if (booked) {

anyBooked = true;

break;

}

}

if (anyBooked) {

cout << "\nSeats that are already taken are indicated with an asterisk (\*\*)";

}

cout << "\nPlease key in a seat number to choose a seat (e.g., A1): ";

cin >> seatInput;

cin.ignore();

// Validate input format (e.g., A1, B2 etc.)

if (seatInput.length() != 2) {

cout << "Invalid format! Please enter a seat number like A1,"

<< " B2, etc.\n";

continue;

}

char row = toupper(seatInput[0]);

int column = seatInput[1] - '0';

// Validate row (A-I) and column (1-6)

if (row < 'A' || row > 'I') {

cout << "Invalid row! Please choose from A to I.\n";

continue;

}

if (column < 1 || column > 6) {

cout << "Invalid column! Please choose from 1 to 6.\n";

continue;

}

// Calculate the seat index in the vector

int rowIndex = row - 'A';

seatNumber = rowIndex \* 6 + (column - 1);

// Check if seat number exceeds total seats (0-49)

if (seatNumber >= NUM\_SEATS) {

cout << "Invalid seat! This seat does not exist.\n";

continue;

}

// Check if the seat is already booked

if (flight.seats[seatNumber]) {

cout << "That seat is already booked. Please choose another seat.\n";

} else {

validSeat = true;

}

}

return seatNumber + 1; // Return 1 – based seat number

}

// Function to book the seat

void bookSeat(Flight& flight, int seatNumber) {

flight.seats[seatNumber - 1] = true;

}

// Function to display the booking ticket

void displayBookingTicket(const string& fullName, const Flight& flight,

int seatNumber) {

double ticketPrice;

string seatClass;

// Convert seat number to letter + number format

char row = 'A' + (seatNumber - 1) / 6;

int column = ((seatNumber - 1) % 6) + 1;

string seatLabel = string(1, row) + to\_string(column);

if (seatNumber <= FIRST\_CLASS\_ROWS \* 6) {

ticketPrice = ECONOMY\_COST \* FIRST\_CLASS\_MULTIPLIER;

seatClass = "First class";

} else {

ticketPrice = ECONOMY\_COST;

seatClass = "Economy";

}

int departureHour = stoi(flight.departureTime.substr(0, 2));

// Calculate arrival time (2.5 hours)

int arrivalHour = (departureHour + 2) % 24;

int arrivalMinute = 30; //Always 30 minutes

// Convert to string with leading zero if needed

string arrivalHourStr = (arrivalHour < 10 ? "0" : "") + to\_string(arrivalHour);

string arrivalMinuteStr = (arrivalMinute < 10 ? "0" : "") + to\_string(arrivalMinute);

displayTicketBanner();

cout << left << setw(12) << "Name" << ": " << setw(20) << fullName << "Travel Ticket class \t: "

<< seatClass << endl;

cout << left << setw(34) << "" << "Seat No." << "\t\t: " << seatLabel << endl;

cout << left << setw(12) << "Departure" << ": " << setw(20) << "Johannesburg"

<< "Departure Time \t: " << flight.departureTime << endl;

cout << left << setw(12) << "Destination" << ": " << setw(20) << "Cape Town"

<< "Arrival Time \t\t: " << arrivalHourStr << ":" << arrivalMinuteStr << endl;

displayTicketBanner2(ticketPrice);

}

// Function to display booking summary (with detailed bookings)

void displayBookingSummary(const vector<Flight>& flights,

const vector<Booking>& bookings) {

cout << "\nBooking Summary:\n";

printDashLine(39);

// Display total bookings per flight

for (size\_t i = 0; i < flights.size(); ++i) {

cout << "Number of bookings made for " << flights[i].departureTime

<< ": " << flights[i].bookings << "\n";

}

cout << "\nDetailed Bookings:\n";

printDashLine(39);

if (bookings.empty()) {

cout << "No bookings have been made.\n";

return;

}

for (const Booking& b : bookings) {

const Flight& flight = flights[b.flightIndex];

// Convert seat number to letter + number format

char row = 'A' + (b.seatNumber - 1) / 6;

int column = ((b.seatNumber - 1) % 6) + 1;

string seatLabel = string(1, row) + to\_string(column);

cout << left << setw(25) << b.fullName

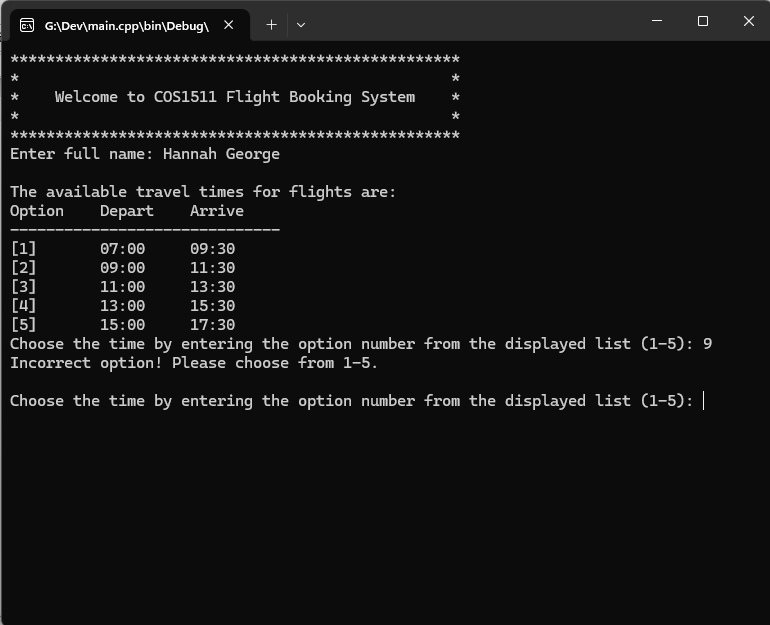
<< "Flight: " << setw(6) << flight.departureTime

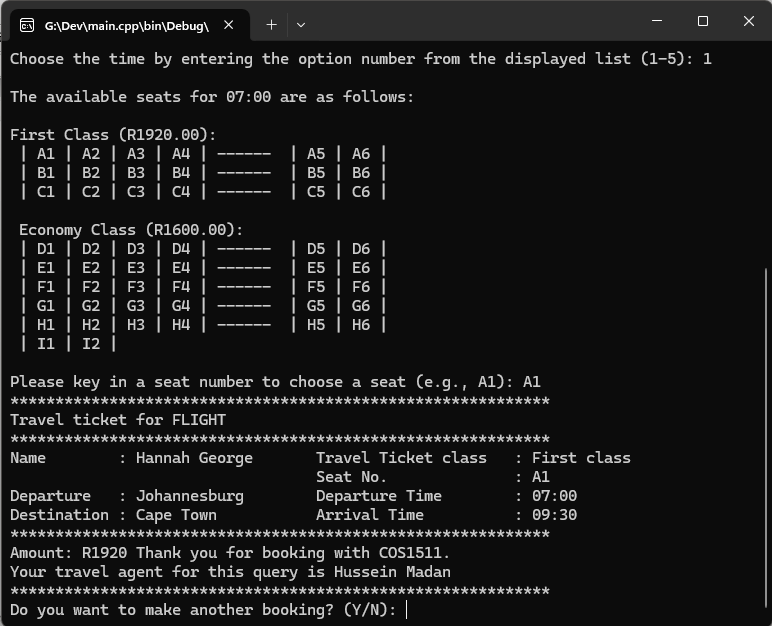
<< " Seat: " << seatLabel << endl;

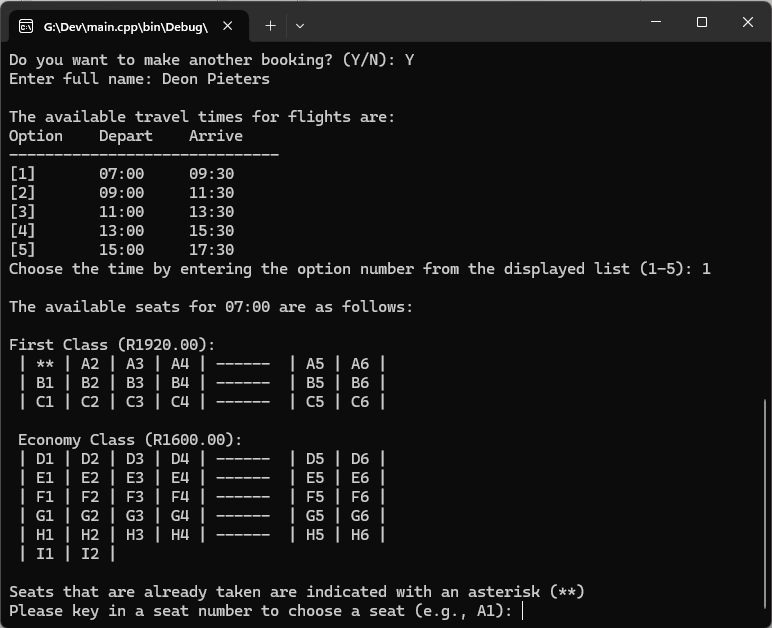
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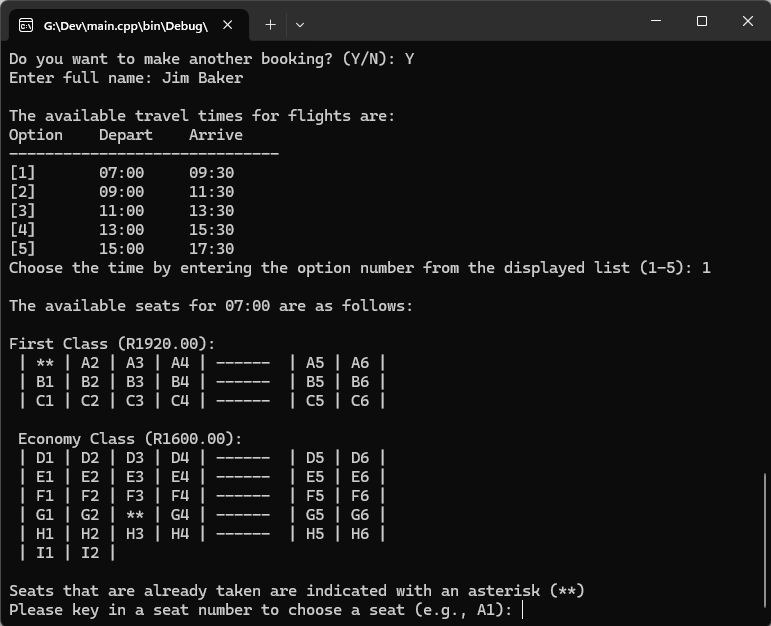
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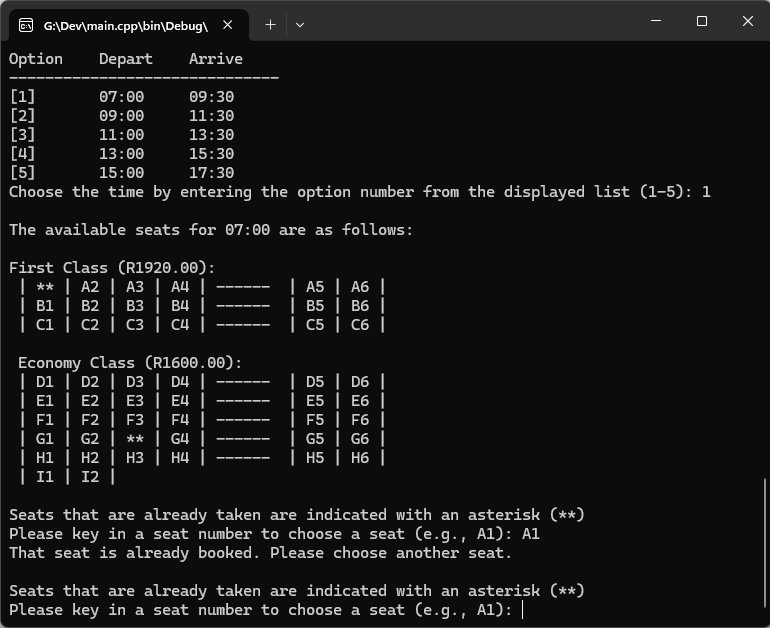
**Output:**

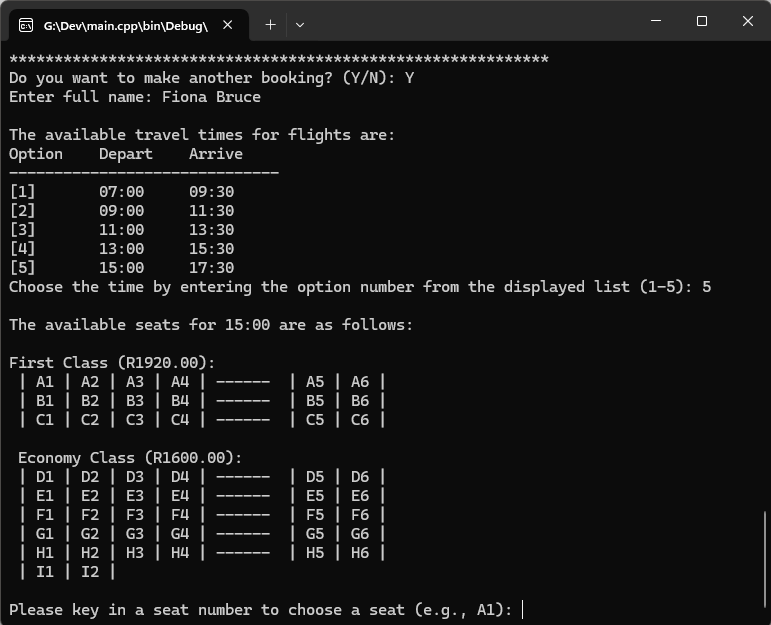
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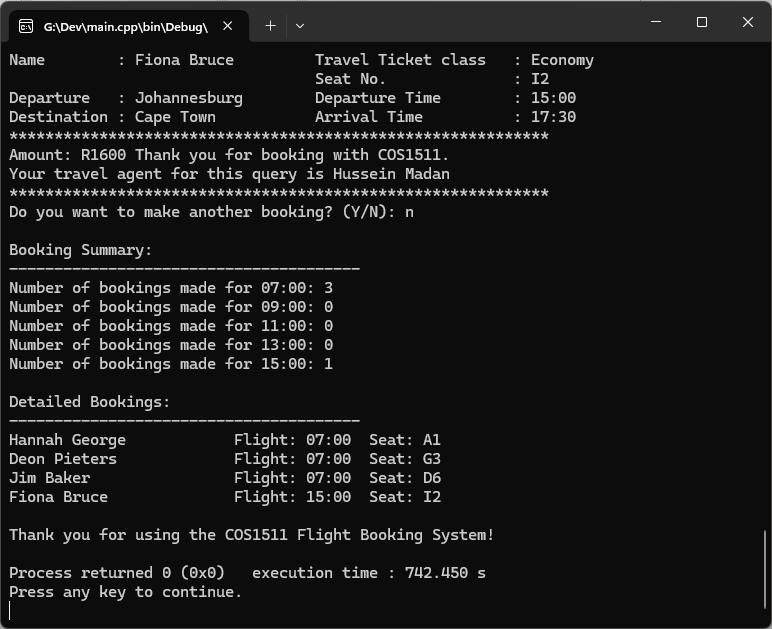
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