

# COMPUTER ORGANIZATION & ASSEMBLY LANGUAGE LAB PROJECT

Car Rental System

# Submitted by

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### Computer Organization & Assembly Language Lab Project BS Computer Science, Batch 2022F

## Car Rental System

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### **Project Summary/Abstract**

### **Brief Introduction:**

The program displays a menu with options to rent different types of luxury cars, show records, delete records, or exit the program. Each car has an associated hourly rate.

### CODE:

CRLF MACRO CR,LF

MOV AH,2 ; DOS function to display a character MOV DL,CR ; Move carriage return character to DL

INT 21H ; Call DOS interrupt

MOV DL,LF ; Move line feed character to DL

INT 21H ; Call DOS interrupt

**ENDM** 

**OUTPUT MACRO STRING** 

MOV AH,09 ; DOS function to display a string

MOV DX,OFFSET STRING ; Load effective address of the string to DX

INT 21H ; Call DOS interrupt

**ENDM** 

**CURSOR MACRO ROW, COLUMN** 

MOV AH,02 ; BIOS function to set cursor position

MOV BH,00 ; Display page number

MOV DH,ROW ; Row position
MOV DL,COLUMN ; Column position
INT 10H ; Call BIOS interrupt

**ENDM** 

CLEAR\_SCREEN MACRO INTERRUPT

MOV AH,6 ; Video BIOS function to clear the screen

MOV AL,0 ; Character attribute for clearing

MOV BH,7 ; Display page number

MOV CX,0 ; Starting row and column (CX = 0) MOV DX,184FH ; Ending row and column (DX = 184FH)

INT INTERRUPT ; Call specified interrupt

ENDM

.MODEL SMALL ; Memory model .STACK 100H : Stack size

.DATA

MENU1 DB 0DH, 0AH,'1. Rent a car\$' ; Menu option 1
MENU2 DB 0DH, 0AH,'2. Show the record\$' ; Menu option 2
MENU3 DB 0DH, 0AH,'3. Delete the record\$' ; Menu option 3
MENU4 DB 0DH, 0AH,'4. Exit\$' ; Menu option 4

C1 DB 0DH, 0AH, 'Choice: \$' ; Prompt for user input

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T2 DB 0DH, 0AH, '*************Rent Car****************************
                                                             ; Rent car title
MENU5 DB ODH, OAH, 1. Rent Ferrari (9 dollar per hour) $'
                                                             ; Rent option 1
MENU6 DB 0DH, 0AH, '2. Rent BMW (8 dollar per hour) $'
                                                             ; Rent option 2
MENU7 DB 0DH, 0AH, '3. Rent Mercedes (7 dollar per hour) $'
                                                             ; Rent option 3
MENU8 DB 0DH, 0AH, '4. Back$'; Rent option 4
BAC DB ODH, OAH, "1. Back to main$"
                                                             ; Back option
MSG_F DB 0DH, 0AH, 'All Available Ferrari rented$'
                                                              ; Message for all Ferrari rented
MSG_B DB 0DH, 0AH, 'All Available BMW rented$'
                                                              ; Message for all BMW rented
MSG_M DB ODH, OAH, 'All Available Mercedes rented$'
                                                              ; Message for all Mercedes rented
MSG_A DB ODH, OAH, 'All Available Cars rented$'
                                                              ; Message for all Cars rented
MSG2 DB 0DH, 0AH, Wrong input$'
                                                              ; Message for wrong input
T3 DB 0DH, 0AH, '*************Record****************************
                                                             : Record title
MSG7 DB 0DH, 0AH, Total amount earned= $'
                                                              ; Message for total amount earned
MSG8 DB 0DH, 0AH, Total number of Vehicles rented= $'
                                                              ; Message for total vehicles rented
MSG9 DB 0DH, 0AH, 'Total number of Ferrari rented= $'
                                                              ; Message for Ferrari rented
MSG10 DB 0DH, 0AH, 'Total number of BMW rented= $'
                                                              ; Message for BMW rented
MSG11 DB 0DH, 0AH, Total number of Mercedes rented= $'
                                                              ; Message for Mercedes rented
: Delete record title
D1 DB 0DH, 0AH, 1. Ferrari returned $'
                                                              ; Delete option 1
D2 DB 0DH, 0AH, '2. BMW returned$'
                                                              ; Delete option 2
D3 DB 0DH, 0AH, '3. Mercedes returned $'
                                                              ; Delete option 3
MSG12 DB 0DH, 0AH, 'Record deleted successfully$'
                                                              ; Message for record deleted successfully
MSG15 DB 0DH, 0AH, 'No Ferrari rented$'
                                                              ; Message for no Ferrari rented
MSG16 DB 0DH, 0AH, 'No BMW rented$'
                                                              ; Message for no BMW rented
MSG17 DB 0DH, 0AH, 'No BMW rented$'
                                                              ; Message for no BMW rented
MSG18 DB 0DH, 0AH, 'No Record to delete, First rent a car$'
                                                              ; Message for no record to delete
MSG13 DB 0DH, 0AH, Enter the number of hours (max 9 hours): $'
                                                                  ; Message for entering hours
MSG14 DB 0DH, 0AH, Total amount of rent: $'
                                                                  ; Message for total amount of rent
INPUT_MENU DB?
                              ; Variable for storing user input for menu
                              ; Variable for storing user input for rent
INPUT_R DB?
INPUT_F DB?
                              ; Variable for storing user input for Ferrari
INPUT_B DB?
                              ; Variable for storing user input for BMW
                              ; Variable for storing user input for Mercedes
INPUT_M DB?
```

; Variable for storing user input for delete

INPUT\_D DB?

AMOUNT\_HH DB? ; Variable to store the total amount

AMOUNT\_H DB? ; Variable to store the total amount (high digit)
AMOUNT\_L DB? ; Variable to store the total amount (low digit)

AM\_FHH DB?

AM\_FH DB? ; Variable to store amount for Ferrari (high digit)
AM\_FL DB? ; Variable to store amount for Ferrari (low digit)

AM\_BMWHH DB?

AM\_BMWH DB? ; Variable to store amount for BMW (high digit) AM\_BMWL DB? ; Variable to store amount for BMW (low digit)

AM\_MHH DB?

AM\_MH DB? ; Variable to store amount for Mercedes (high digit)
AM\_ML DB? ; Variable to store amount for Mercedes (low digit)

COUNT DB '0' ; Variable to store the count of vehicles

F DB '0' ; Variable to store the count of Ferrari
B DB '0' ; Variable to store the count of BMW
M DB '0' ; Variable to store the count of Mercedes

.CODE

; MAIN PROCEDURE

MAIN PROC

MOV AX, @DATA ; LOAD DATA SEGMENT ADDRESS TO AX MOV DS, AX ; INITIALIZE DATA SEGMENT REGISTER

WHILE\_M:

OUTPUT T1 ; DISPLAY MAIN MENU TITLE CRLF 13,10 ; MOVE TO THE NEXT LINE

OUTPUT MENU1 ; DISPLAY MAIN MENU OPTIONS

OUTPUT MENU2 OUTPUT MENU3 OUTPUT MENU4

CRLF 13,10 ; MOVE TO THE NEXT LINE OUTPUT C1 ; PROMPT FOR USER INPUT

MOV AH, 1; READ A KEY
INT 21H; DOS INTERRUPT
MOV INPUT\_MENU, AL; STORE USER INPUT

CRLF 13,10 ; MOVE TO THE NEXT LINE

MOV AL, INPUT\_MENU ; COMPARE USER INPUT CMP AL, '1' ; COMPARE WITH '1'

JE RENT1 ; JUMP TO RENT1 IF EQUAL

CMP AL, '2' ; COMPARE WITH '2'

JE REC ; JUMP TO REC IF EQUAL

CMP AL, '3' ; COMPARE WITH '3'

JE DEL ; JUMP TO DEL IF EQUAL

CMP AL, '4' ; COMPARE WITH '4'

JE END\_ ; JUMP TO END\_ IF EQUAL

OUTPUT MSG2 ; DISPLAY ERROR MESSAGE CRLF 13,10 ; MOVE TO THE NEXT LINE

JMP DISPLAY\_M ; JUMP TO MAIN MENU DISPLAY

RENT1:

CALL RENT ; JUMP TO RENT PROCEDURE

REC:

CALL RECORD ; JUMP TO RECORD PROCEDURE

DEL:

CALL DELETE ; JUMP TO DELETE PROCEDURE

END\_:

MOV AH, 4CH ; TERMINATE PROGRAM

INT 21H ; DOS INTERRUPT

DISPLAY\_M:

NOP ; NO OPERATION CLEAR\_SCREEN 10H ; CLEAR SCREEN

CURSOR 01H, 00H ; SET CURSOR POSITION

JMP WHILE\_M ; JUMP TO MAIN MENU LOOP

MAIN ENDP

; RENT PROCEDURE

RENT PROC

JMP DISPLAY\_R ; JUMP TO RENT DISPLAY

WHILE\_R:

OUTPUT T2 ; DISPLAY RENT MENU TITLE CRLF 13,10 ; MOVE TO THE NEXT LINE

MOV AL, COUNT ; MOVE COUNT TO AL CMP AL, '9' ; COMPARE AL WITH 9

JE NO\_CAR ;JUMP TO NO\_CAR IF EQUAL

OUTPUT MENU5 ; DISPLAY RENT MENU OPTIONS

OUTPUT MENU6 OUTPUT MENU7 OUTPUT MENU8

CRLF 13,10 ; MOVE TO THE NEXT LINE

OUTPUT C1 ; PROMPT FOR USER INPUT

MOV AH, 1 ; READ A KEY
INT 21H ; DOS INTERRUPT
MOV INPUT\_R, AL ; STORE USER INPUT

CRLF 13,10 ; MOVE TO THE NEXT LINE

MOV AL, INPUT\_R ; COMPARE USER INPUT CMP AL, '1' ; COMPARE WITH '1'

JE FERRARI ; JUMP TO FERRARI IF EQUAL

CMP AL, '2' ; COMPARE WITH '2'

JE BMW ; JUMP TO BMW IF EQUAL

CMP AL, '3' ; COMPARE WITH '3'

JE MERCEDES ; JUMP TO MERCEDES IF EQUAL

CMP AL, '4' ; COMPARE WITH '4'

JE DISPLAY\_M ; JUMP TO DISPLAY\_M IF EQUAL

OUTPUT MSG2 ; DISPLAY ERROR MESSAGE CRLF 13,10 ; MOVE TO THE NEXT LINE

JMP DISPLAY\_R ; JUMP TO RENT MENU DISPLAY

NO\_CAR:

OUTPUT MSG\_A ; DISPLAY ALL AVAILABLE CARS RENTED MESSAGE

CRLF 13,10 ; MOVE TO THE NEXT LINE

OUTPUT BAC ; DISPLAY BACK OPTION CRLF 13,10 ; MOVE TO THE NEXT LINE

MOV AH, 1 ; DOS FUNCTION TO READ A CHARACTER

INT 21H ; DOS INTERRUPT

CMP AL, '1' ; COMPARE AL WITH '1'

JE DISPLAY\_M ; JUMP TO MAIN MENU IF EQUAL

OUTPUT MSG2 ; DISPLAY ERROR MESSAGE CRLF 13,10 ; MOVE TO THE NEXT LINE

JMP AGAIN\_W ; JUMP TO AGAINW

**FERRARI**:

CALL FERARI ; JUMP TO FERRARI RENT PROCEDURE

CRLF 13,10 ; MOVE TO THE NEXT LINE

AGAIN\_W:

OUTPUT BAC ; DISPLAY BACK OPTION CRLF 13,10 ; MOVE TO THE NEXT LINE

MOV AH, 1 ; READ A KEY
INT 21H ; DOS INTERRUPT

CMP AL, '1' ; COMPARE WITH '1'

JE DISPLAY\_M ; JUMP TO MAIN MENU IF EQUAL

OUTPUT MSG2 ; DISPLAY ERROR MESSAGE CRLF 13,10 ; MOVE TO THE NEXT LINE

JMP AGAIN\_W ; JUMP TO THE BACK OPTION DISPLAY

BMW:

CALL BMWW ; JUMP TO BMW RENT PROCEDURE

CRLF 13,10 ; MOVE TO THE NEXT LINE

OUTPUT BAC ; DISPLAY BACK OPTION CRLF 13,10 ; MOVE TO THE NEXT LINE

MOV AH, 1 ; READ A KEY
INT 21H ; DOS INTERRUPT

CMP AL, '1' ; COMPARE WITH '1'

JE DISPLAY\_M ; JUMP TO MAIN MENU IF EQUAL

OUTPUT MSG2 ; DISPLAY ERROR MESSAGE CRLF 13,10 ; MOVE TO THE NEXT LINE

JMP AGAIN\_W ; JUMP TO THE BACK OPTION DISPLAY

MERCEDES:

CALL MERCEDE ; JUMP TO MERCEDES RENT PROCEDURE

CRLF 13,10 ; MOVE TO THE NEXT LINE

OUTPUT BAC ; DISPLAY BACK OPTION CRLF 13,10 ; MOVE TO THE NEXT LINE

MOV AH, 1 ; READ A KEY INT 21H ; DOS INTERRUPT

CMP AL, '1' ; COMPARE WITH '1'

JE DISPLAY\_M ; JUMP TO MAIN MENU IF EQUAL

OUTPUT MSG2 ; DISPLAY ERROR MESSAGE CRLF 13,10 ; MOVE TO THE NEXT LINE

JMP AGAIN\_W ; JUMP TO THE BACK OPTION DISPLAY

DISPLAY\_R:

NOP ; NO OPERATION

CLEAR\_SCREEN 10H ; CLEAR SCREEN

CURSOR 01H, 00H ; SET CURSOR POSITION

JMP WHILE\_R ; JUMP TO RENT MENU LOOP

**RENT ENDP** 

; FERARI PROCEDURE

FERARI PROC

CMP F, '2' ; COMPARE F VARIABLE WITH '2'

JLE FERARI1 ; JUMP TO FERARI1 IF LESS THAN OR EQUAL

OUTPUT MSG\_F : DISPLAY MESSAGE WHEN ALL FERRARI IS RENTED

CRLF 13,10 ; MOVE TO THE NEXT LINE

OUTPUT BAC ; DISPLAY BACK OPTION CRLF 13,10 ; MOVE TO THE NEXT LINE

MOV AH, 1 ; READ A KEY
INT 21H ; DOS INTERRUPT

CMP AL, '1' ; COMPARE WITH '1'

JE DISPLAY\_M ; JUMP TO MAIN MENU IF EQUAL

OUTPUT MSG2 ; DISPLAY ERROR MESSAGE CRLF 13,10 ; MOVE TO THE NEXT LINE

JMP AGAIN\_W ; JUMP TO BACK OPTION DISPLAY

FERARI1:

AGAIN\_F:

OUTPUT MSG13 : DISPLAY PROMPT FOR NUMBER OF HOURS

MOV AH, 1 ; READ A KEY
INT 21H ; DOS INTERRUPT

CMP AL,'1' ; COMPARE WITH '1'

JE CAL\_F ; JUMP TO CAL\_F IF EQUAL

CMP AL,'2' ; COMPARE WITH '2'

JE CAL\_F ; JUMP TO CAL\_F IF EQUAL

CMP AL,'3' ; COMPARE WITH '3'

JE CAL\_F ; JUMP TO CAL\_F IF EQUAL

CMP AL,'4' ; COMPARE WITH '4'

JE CAL\_F ; JUMP TO CAL\_F IF EQUAL

CMP AL,'5' ; COMPARE WITH '5'

JE CAL\_F ; JUMP TO CAL\_F IF EQUAL

CMP AL,'6'; COMPARE WITH '6'

JE CAL\_F ; JUMP TO CAL\_F IF EQUAL

CMP AL,'7' ; COMPARE WITH '7'

JE CAL\_F ; JUMP TO CAL\_F IF EQUAL

CMP AL.'8' ; COMPARE WITH '8'

JE CAL\_F ; JUMP TO CAL\_F IF EQUAL

CMP AL,'9' ; COMPARE WITH '9'

JE CAL\_F ; JUMP TO CAL\_F IF EQUAL

CRLF 13,10 ; MOVE TO THE NEXT LINE

OUTPUT MSG2 ; DISPLAY ERROR MESSAGE CRLF 13,10 ; MOVE TO THE NEXT LINE

JMP AGAIN\_F ; JUMP TO THE PROMPT FOR NUMBER OF HOURS

CAL\_F:

AND AL, 0FH ; MASK UPPER 4 BITS OF AL

MOV INPUT\_F, AL ; STORE INPUTF VARIABLE WITH AL

OUTPUT MSG14 ; DISPLAY PROMPT FOR TOTAL AMOUNT

MOV AX, 00 ; INITIALIZE AX REGISTER MOV BX, 00 ; INITIALIZE BX REGISTER

MOV AL, '9' ; LOAD CONSTANT '9' TO AL AND AL, 0FH ; MASK UPPER 4 BITS OF AL

MOV BL, INPUT\_F ; LOAD INPUTF TO BL

AND BL, OFH ; MASK UPPER 4 BITS OF BL

MUL BL ; MULTIPLY AX BY BL

AAM : ASCII ADJUST AFTER MULTIPLICATION

OR AX, 3030H ; CONVERT TO ASCII

MOV AM\_FH, AH ; STORE HIGH DIGIT TO AM\_FH MOV AM\_FL, AL ; STORE LOW DIGIT TO AM\_FL

MOV BX, AX ; MOVE AX TO BX

MOV AH, 2 ; DOS FUNCTION TO DISPLAY A CHARACTER

MOV DL, BH ; LOAD HIGH DIGIT TO DL

INT 21H ; DOS INTERRUPT

MOV AH, 2 ; DOS FUNCTION TO DISPLAY A CHARACTER

MOV DL, BL ; LOAD LOW DIGIT TO DL

INT 21H ; DOS INTERRUPT

MOV AX, 00 ; INITIALIZE AX REGISTER MOV BX, 00 ; INITIALIZE BX REGISTER

MOV BL, AMOUNT\_L ; LOAD AMOUNT\_L TO BL MOV AL, AM\_FL ; LOAD AM\_FL TO AL ADD AL, BL ; ADD AL AND BL

AAA ; ASCII ADJUST AFTER ADDITION

OR AX, 3030H ; CONVERT TO ASCII MOV BX, AX ; MOVE AL TO BL

MOV AX,00 ; INITIALIZE AX REGISTER

MOV AMOUNT\_L, BL ; STORE BL TO AMOUNT\_L

ADD AMOUNT\_H, BH ; ADD BH TO AMOUNT\_H

MOV BL, AMOUNT\_H ; MOVE AMOUNT\_H TO BL MOV AL, AM\_FH ; MOVE AM\_FH TO AL ADD AL, BL ; ADD AL AND BL

AAA ; ASCII ADJUST AFTER ADDITION

OR AX, 3030H ; CONVERT TO ASCII

MOV CX, AX ; MOVE AX TO CX

MOV AMOUNT\_H, CL ; MOVE CL TO AMOUNT\_H ADD AMOUNT\_HH,CH ; ADD CH AND AMOUNT\_HH

MOV AX, 00 ; INITIALIZE AX REGISTER MOV CX, 00 ; INITIALIZE CX REGISTER

MOV BL,AMOUNT\_HH ; MOVE AMOUNT\_HH TO BL
MOV AL,AM\_FHH ; MOVE AM\_FHH TO AL

ADD AL, BL ; ADD AL AND BL

AAA ; ASCII ADJUST AFTER ADDITION

OR AX, 3030H ; CONVERT TO ASCII

MOV CX,AX ; MOVE AX TO CX

MOV AMOUNT\_HH, CL ; MOVE CL TO AMOUNT\_HH

INC COUNT ; INCREMENT COUNT INC F ; INCREMENT F

RET ; RETURN FROM PROCEDURE

#### FERARI ENDP

; BMWW PROCEDURE

BMWW PROC

CMP B, '2' ; COMPARE B VARIABLE WITH '2'

JLE BMWW1 ; JUMP TO BMWW1 IF LESS THAN OR EQUAL

OUTPUT MSG\_B ; DISPLAY MESSAGE WHEN ALL BMW IS RENTED

CRLF 13,10 ; MOVE TO THE NEXT LINE

OUTPUT BAC ; DISPLAY BACK OPTION CRLF 13,10 ; MOVE TO THE NEXT LINE

MOV AH, 1 ; READ A KEY
INT 21H ; DOS INTERRUPT

CMP AL, '1' ; COMPARE WITH '1'

JE DISPLAY\_M ; JUMP TO MAIN MENU IF EQUAL

OUTPUT MSG2 ; DISPLAY ERROR MESSAGE CRLF 13,10 ; MOVE TO THE NEXT LINE

JMP AGAIN\_W ; JUMP TO BACK OPTION DISPLAY

BMWW1:

AGAIN\_B:

OUTPUT MSG13 ; DISPLAY PROMPT FOR NUMBER OF HOURS

MOV AH, 1 ; READ A KEY
INT 21H ; DOS INTERRUPT

CMP AL,'1' ; COMPARE WITH '1'

JE CAL\_B ; JUMP TO CAL\_B IF EQUAL

CMP AL,'2' ; COMPARE WITH '2'

JE CAL\_B ; JUMP TO CAL\_B IF EQUAL

CMP AL,'3' ; COMPARE WITH '3'

JE CAL\_B ; JUMP TO CAL\_B IF EQUAL

CMP AL,'4' ; COMPARE WITH '4'

JE CAL\_B ; JUMP TO CAL\_B IF EQUAL

CMP AL,'5' ; COMPARE WITH '5'

JE CAL\_B ; JUMP TO CAL\_B IF EQUAL

CMP AL,'6' ; COMPARE WITH '6'

JE CAL\_B ; JUMP TO CAL\_B IF EQUAL

CMP AL,'7' ; COMPARE WITH '7'

JE CAL\_B ; JUMP TO CAL\_B IF EQUAL

CMP AL,'8'; COMPARE WITH '8'

JE CAL\_B ; JUMP TO CAL\_B IF EQUAL

CMP AL,'9' ; COMPARE WITH '9'

JE CAL\_B ; JUMP TO CAL\_B IF EQUAL

CRLF 13,10 ; MOVE TO THE NEXT LINE

OUTPUT MSG2 ; DISPLAY ERROR MESSAGE CRLF 13,10 ; MOVE TO THE NEXT LINE

JMP AGAIN\_B ; JUMP TO THE PROMPT FOR NUMBER OF HOURS

CAL\_B:

AND AL, OFH ; MASK UPPER 4 BITS OF AL

MOV INPUT\_B, AL ; STORE INPUTB VARIABLE WITH AL

OUTPUT MSG14 ; DISPLAY PROMPT FOR TOTAL AMOUNT

MOV AX, 00 ; INITIALIZE AX REGISTER MOV BX, 00 ; INITIALIZE BX REGISTER

MOV AL, '8' ; LOAD CONSTANT '8' TO AL AND AL, 0FH ; MASK UPPER 4 BITS OF AL

MOV BL, INPUT\_B ; LOAD INPUTB TO BL

AND BL, 0FH ; MASK UPPER 4 BITS OF BL

MUL BL ; MULTIPLY AX BY BL

AAM ; ASCII ADJUST AFTER MULTIPLICATION

OR AX, 3030H ; CONVERT TO ASCII

MOV AM\_BMWH, AH ; STORE HIGH DIGIT TO AM\_BMWH MOV AM\_BMWL, AL ; STORE LOW DIGIT TO AM\_BMWL

MOV BX, AX ; MOVE AX TO BX

MOV AH, 2 ; DOS FUNCTION TO DISPLAY A CHARACTER

MOV DL, BH ; LOAD HIGH DIGIT TO DL

INT 21H : DOS INTERRUPT

MOV AH, 2 ; DOS FUNCTION TO DISPLAY A CHARACTER

MOV DL, BL ; LOAD LOW DIGIT TO DL

INT 21H ; DOS INTERRUPT

; ADD OPERATION

MOV AX, 00 ; INITIALIZE AX REGISTER MOV BX, 00 ; INITIALIZE BX REGISTER

MOV BL, AMOUNT\_L ; LOAD AMOUNT\_L TO BL MOV AL, AM\_BMWL ; LOAD AM\_BMWL TO AL

ADD AL, BL ; ADD AL AND BL

AAA ; ASCII ADJUST AFTER ADDITION

OR AX, 3030H ; CONVERT TO ASCII

MOV BX, AX ; MOVE AX TO BX

MOV AX,00 ; INITIALIZE AX REGISTER

MOV AMOUNT\_L, BL ; STORE BL TO AMOUNT\_L ADD AMOUNT\_H, BH ; ADD BH TO AMOUNT\_H

MOV BL, AMOUNT\_H ; MOVE AMOUNT\_H TO BL MOV AL, AM\_BMWH ; MOVE AM\_BMWH TO AL

ADD AL, BL ; ADD AL AND BL

AAA ; ASCII ADJUST AFTER ADDITION

OR AX, 3030H ; CONVERT TO ASCII

MOV CX, AX ; MOVE AX TO CX

MOV AMOUNT\_H, CL ; MOVE CL TO AMOUNT\_H ADD AMOUNT\_HH,CH ; MOVE CH TO AMOUNT\_HH

MOV AX,00 ; INITIALIZE AX REGISTER MOV CX,00 ; INITIALIZE CX REGISTER

MOV BL,AMOUNT\_HH ; MOVE AMOUNT\_HH TO BL MOV AL,AM\_BMWHH ; MOVE AM\_BMWHH TO AL

ADD AL, BL ; ADD AL AND BL

AAA ; ASCII ADJUST AFTER ADDITION

OR AX, 3030H ; CONVERT TO ASCII

MOV CX,AX ; MOVE AX TO CX

MOV AMOUNT\_HH, CL ; MOVE CL TO AMOUNT\_HH

INC COUNT ; INCREMENT COUNT

INC B ; INCREMENT B

RET ; RETURN FROM PROCEDURE

**BMWW ENDP** 

; MERCEDE PROCEDURE

MERCEDE PROC

CMP M, '2' ; COMPARE M VARIABLE WITH '2'

JLE MERCEDE1 ; JUMP TO MERCEDE1 IF LESS THAN OR EQUAL

OUTPUT MSG\_M ; DISPLAY MESSAGE WHEN ALL MERCEDES ARE RENTED

CRLF 13,10 ; MOVE TO THE NEXT LINE

OUTPUT BAC ; DISPLAY BACK OPTION CRLF 13,10 ; MOVE TO THE NEXT LINE

MOV AH, 1 ; READ A KEY
INT 21H ; DOS INTERRUPT

CMP AL, '1' ; COMPARE WITH '1'

JE DISPLAY\_M ; JUMP TO MAIN MENU IF EQUAL

OUTPUT MSG2 ; DISPLAY ERROR MESSAGE CRLF 13,10 ; MOVE TO THE NEXT LINE

JMP AGAIN\_W ; JUMP TO BACK OPTION DISPLAY

**MERCEDE1**:

AGAIN\_M:

OUTPUT MSG13 ; DISPLAY PROMPT FOR NUMBER OF HOURS

MOV AH, 1 ; READ A KEY
INT 21H ; DOS INTERRUPT

CMP AL,'1' ; COMPARE WITH '1'

JE CAL\_M ; JUMP TO CAL\_M IF EQUAL

CMP AL,'2' ; COMPARE WITH '2'

JE CAL\_M ; JUMP TO CAL\_M IF EQUAL

CMP AL,'3' ; COMPARE WITH '3'

JE CAL\_M ; JUMP TO CAL\_M IF EQUAL

CMP AL,'4' ; COMPARE WITH '4'

JE CAL\_M ; JUMP TO CAL\_M IF EQUAL

CMP AL,'5' ; COMPARE WITH '5'

JE CAL\_M ; JUMP TO CAL\_M IF EQUAL

CMP AL,'6' ; COMPARE WITH '6'

JE CAL\_M ; JUMP TO CAL\_M IF EQUAL

CMP AL,'7' ; COMPARE WITH '7'

JE CAL\_M ; JUMP TO CAL\_M IF EQUAL

CMP AL,'8'; COMPARE WITH '8'

JE CAL\_M ; JUMP TO CAL\_M IF EQUAL

CMP AL,'9' ; COMPARE WITH '9'

JE CAL\_M ; JUMP TO CAL\_M IF EQUAL

CRLF 13,10 ; MOVE TO THE NEXT LINE

OUTPUT MSG2 ; DISPLAY ERROR MESSAGE CRLF 13,10 ; MOVE TO THE NEXT LINE

JMP AGAIN\_M ; JUMP TO THE PROMPT FOR NUMBER OF HOURS

CAL\_M:

AND AL, 0FH ; MASK UPPER 4 BITS OF AL

MOV INPUT\_M, AL ; STORE INPUTM VARIABLE WITH AL

OUTPUT MSG14 ; DISPLAY PROMPT FOR TOTAL AMOUNT

MOV AX, 00 ; INITIALIZE AX REGISTER MOV BX, 00 ; INITIALIZE BX REGISTER

MOV AL, '7' ; LOAD CONSTANT '7' TO AL AND AL, 0FH ; MASK UPPER 4 BITS OF AL

MOV BL, INPUT\_M ; LOAD INPUTM TO BL

AND BL, 0FH ; MASK UPPER 4 BITS OF BL

MUL BL ; MULTIPLY AX BY BL

AAM ; ASCII ADJUST AFTER MULTIPLICATION

OR AX, 3030H ; CONVERT TO ASCII

MOV AM\_MH, AH ; STORE HIGH DIGIT TO AM\_MH MOV AM\_ML, AL ; STORE LOW DIGIT TO AM\_ML

MOV BX, AX ; MOVE AX TO BX

MOV AH, 2 ; DOS FUNCTION TO DISPLAY A CHARACTER

MOV DL, BH ; LOAD HIGH DIGIT TO DL

INT 21H ; DOS INTERRUPT

MOV AH, 2 ; DOS FUNCTION TO DISPLAY A CHARACTER

MOV DL, BL ; LOAD LOW DIGIT TO DL

INT 21H ; DOS INTERRUPT

; ADD OPERATION

MOV AX, 00 ; INITIALIZE AX REGISTER MOV BX, 00 ; INITIALIZE BX REGISTER

MOV BL, AMOUNT\_L ; LOAD AMOUNT\_L TO BL MOV AL, AM\_ML ; LOAD AM\_ML TO AL ADD AL, BL ; ADD AL AND BL

AAA ; ASCII ADJUST AFTER ADDITION

OR AX, 3030H ; CONVERT TO ASCII MOV BX, AX ; MOVE AL TO BL

MOV AX,00 ; INITIALIZE AX REGISTER

MOV AMOUNT\_L, BL ; STORE BL TO AMOUNT\_L ADD AMOUNT\_H, BH ; ADD BH TO AMOUNT\_H

MOV BL, AMOUNT\_H ; MOVE AMOUNT\_H TO BL MOV AL, AM\_MH ; MOVE AM\_MH TO AL

ADD AL, BL ; ADD AL AND BL

AAA ; ASCII ADJUST AFTER ADDITION

OR AX,3030H ; CONVERT TO ASCII

MOV CX, AX ; MOVE AX TO CX

MOV AMOUNT\_H, CL ; MOVE CL TO AMOUNT\_H ADD AMOUNT\_HH,CH ; MOVE CH TO AMOUNT\_HH

MOV AX,00 ; INITIALIZE AX REGISTER MOV CX,00 ; INITIALIZE CX REGISTER

MOV BL,AMOUNT\_HH ; MOVE AMOUNT\_HH TO BL MOV AL,AM\_MHH ; MOVE AM\_MHH TO AL ADD AL, BL ; ADD AL AND BL

AAA ; ASCII ADJUST AFTER ADDITION

OR AX,3030H ; CONVERT TO ASCII

MOV CX, AX ; MOVE AX TO CX

MOV AMOUNT\_HH, CL ; MOVE CL TO AMOUNT\_HH

INC COUNT ; INCREMENT COUNT INC M ; INCREMENT M

RET ; RETURN FROM PROCEDURE

MERCEDE ENDP

; RECORD PROCEDURE

RECORD PROC

JMP DISPLAY\_RE ; JUMP TO DISPLAYRE

WHILE\_RE:

OUTPUT T3 ; DISPLAY RECORD TITLE CRLF 13,10 ; MOVE TO THE NEXT LINE

OUTPUT MSG8 ; DISPLAY TOTAL NUMBER OF VEHICLES RENTED

MOV DL, COUNT ; MOVE COUNT TO DL

MOV AH, 2 ; DOS FUNCTION TO DISPLAY A CHARACTER

INT 21H ; DOS INTERRUPT

OUTPUT MSG9 ; DISPLAY TOTAL NUMBER OF FERRARI RENTED

MOV DL, F; MOVE F TO DL

MOV AH, 2 ; DOS FUNCTION TO DISPLAY A CHARACTER

INT 21H ; DOS INTERRUPT

OUTPUT MSG10 : DISPLAY TOTAL NUMBER OF BMW RENTED

MOV DL, B ; MOVE B TO DL

MOV AH, 2 ; DOS FUNCTION TO DISPLAY A CHARACTER

INT 21H ; DOS INTERRUPT

OUTPUT MSG11 ; DISPLAY TOTAL NUMBER OF MERCEDES RENTED

MOV DL, M ; MOVE M TO DL

MOV AH, 2 ; DOS FUNCTION TO DISPLAY A CHARACTER

INT 21H ; DOS INTERRUPT

CRLF 13,10 ; MOVE TO THE NEXT LINE

OUTPUT MSG7 ; DISPLAY TOTAL AMOUNT EARNED

MOV AH, 2 ; DOS FUNCTION TO DISPLAY A CHARACTER

MOV DL, AMOUNT\_HH ; MOVE AMOUNTHH TO DL

INT 21H ; DOS INTERRUPT

MOV AH, 2 ; DOS FUNCTION TO DISPLAY A CHARACTER

MOV DL, AMOUNT\_H ; MOVE AMOUNT\_H TO DL

INT 21H ; DOS INTERRUPT

MOV AH, 2 ; DOS FUNCTION TO DISPLAY A CHARACTER

MOV DL, AMOUNT\_L ; MOVE AMOUNT\_L TO DL

INT 21H ; DOS INTERRUPT

CRLF 13,10 ; MOVE TO THE NEXT LINE

OUTPUT BAC ; DISPLAY BACK OPTION CRLF 13,10 ; MOVE TO THE NEXT LINE

MOV AH, 1 ; READ A KEY
INT 21H ; DOS INTERRUPT

CMP AL, '1' ; COMPARE WITH '1'

JE DISPLAY\_M ; JUMP TO MAIN MENU IF EQUAL

OUTPUT MSG2 ; DISPLAY ERROR MESSAGE CRLF 13,10 ; MOVE TO THE NEXT LINE

JMP DISPLAY\_RE ; JUMP TO DISPLAYRE

DISPLAY\_RE:

NOP ; NO OPERATION

;CLEAR SCREEN

CLEAR\_SCREEN 10H ; CLEAR THE SCREEN

CURSOR 01H,00H ; SET CURSOR TO THE BEGINNING OF THE SCREEN

JMP WHILE\_RE ; JUMP TO WHILE\_RE

**RECORD ENDP** 

; DELETE PROCEDURE

**DELETE PROC** 

JMP DISPLAY\_D ; JUMP TO DISPLAY\_D

WHILE\_D:

OUTPUT T4 ; DISPLAY DELETE RECORD TITLE

CRLF 13,10 ; MOVE TO THE NEXT LINE

MOV AL, COUNT ; MOVE COUNT TO AL CMP AL, '0' ; COMPARE AL WITH '0' JE NO\_R ; JUMP TO NO\_R IF EQUAL

OUTPUT D1 ; DISPLAY DELETE OPTIONS

OUTPUT D2 OUTPUT D3 OUTPUT MENU8

CRLF 13,10 ; MOVE TO THE NEXT LINE

OUTPUT C1 ; DISPLAY CHOICE PROMPT

MOV AH, 1 ; DOS FUNCTION TO READ A CHARACTER

INT 21H ; DOS INTERRUPT MOV INPUT\_D, AL ; SAVE INPUT\_D

MOV AL, INPUT\_D ; MOVE INPUTD TO AL CMP AL, '1' ; COMPARE AL WITH '1' JE DEL1 ; JUMP TO DEL1 IF EQUAL CMP AL, '2' : COMPARE AL WITH '2' JE DEL2 : JUMP TO DEL2 IF EQUAL CMP AL, '3' ; COMPARE AL WITH '3' : JUMP TO DEL3 IF EQUAL JE DEL3 CMP AL, '4' : COMPARE AL WITH '4'

JE DISPLAY\_M ; JUMP TO MAIN MENU IF EQUAL

OUTPUT MSG2 ; DISPLAY ERROR MESSAGE

JMP DISPLAY\_D ; JUMP TO DISPLAYD

NO\_R:

OUTPUT MSG18 ; DISPLAY NO RECORD TO DELETE MESSAGE

CRLF 13,10 ; MOVE TO THE NEXT LINE

OUTPUT BAC ; DISPLAY BACK OPTION CRLF 13,10 ; MOVE TO THE NEXT LINE

MOV AH, 1 ; DOS FUNCTION TO READ A CHARACTER

INT 21H ; DOS INTERRUPT

CMP AL, '1' ; COMPARE AL WITH '1'

JE DISPLAY\_M ; JUMP TO MAIN MENU IF EQUAL

OUTPUT MSG2 ; DISPLAY ERROR MESSAGE CRLF 13,10 ; MOVE TO THE NEXT LINE

JMP AGAIN\_W ; JUMP TO AGAIN\_W

DEL1:

MOV AL, F ; MOVE F TO AL

CMP AL, '0' ; COMPARE AL WITH '0'

JE NO\_F ; JUMP TO NO\_F IF EQUAL

CALL DEL\_F ; CALL DELETE FERRARI PROCEDURE

CRLF 13,10 ; MOVE TO THE NEXT LINE

OUTPUT BAC ; DISPLAY BACK OPTION CRLF 13,10 ; MOVE TO THE NEXT LINE

MOV AH, 1 ; DOS FUNCTION TO READ A CHARACTER

INT 21H ; DOS INTERRUPT

CMP AL, '1' ; COMPARE AL WITH '1'

JE DISPLAY\_M ; JUMP TO MAIN MENU IF EQUAL

OUTPUT MSG2 ; DISPLAY ERROR MESSAGE CRLF 13,10 ; MOVE TO THE NEXT LINE

JMP AGAIN\_W ; JUMP TO AGAINW

NO\_F:

CRLF 13.10 : MOVE TO THE NEXT LINE

OUTPUT MSG15 ; DISPLAY NO FERRARI RENTED MESSAGE

CRLF 13,10 ; MOVE TO THE NEXT LINE

OUTPUT BAC ; DISPLAY BACK OPTION CRLF 13,10 ; MOVE TO THE NEXT LINE

MOV AH, 1; DOS FUNCTION TO READ A CHARACTER

INT 21H ; DOS INTERRUPT

CMP AL, '1' ; COMPARE AL WITH '1'

JE DISPLAY\_M ; JUMP TO MAIN MENU IF EQUAL

OUTPUT MSG2 ; DISPLAY ERROR MESSAGE CRLF 13,10 ; MOVE TO THE NEXT LINE

JMP AGAIN\_W ; JUMP TO AGAIN\_W

DEL2:

MOV AL, B ; MOVE B TO AL

CMP AL, '0' ; COMPARE AL WITH '0'

JE NO\_BMW ; JUMP TO NO\_BMW IF EQUAL

CALL DEL\_B ; CALL DELETE BMW PROCEDURE

CRLF 13,10 ; MOVE TO THE NEXT LINE

OUTPUT BAC ; DISPLAY BACK OPTION CRLF 13,10 ; MOVE TO THE NEXT LINE

MOV AH, 1 ; DOS FUNCTION TO READ A CHARACTER

INT 21H ; DOS INTERRUPT

CMP AL, '1' ; COMPARE AL WITH '1'

JE DISPLAY\_M ; JUMP TO MAIN MENU IF EQUAL

OUTPUT MSG2 ; DISPLAY ERROR MESSAGE CRLF 13,10 ; MOVE TO THE NEXT LINE

JMP AGAIN\_W ; JUMP TO AGAINW

NO\_BMW:

CRLF 13,10 ; MOVE TO THE NEXT LINE

OUTPUT MSG16 ; DISPLAY NO BMW RENTED MESSAGE

CRLF 13,10 ; MOVE TO THE NEXT LINE

OUTPUT BAC ; DISPLAY BACK OPTION CRLF 13,10 ; MOVE TO THE NEXT LINE

MOV AH, 1 ; DOS FUNCTION TO READ A CHARACTER

INT 21H ; DOS INTERRUPT

CMP AL, '1' ; COMPARE AL WITH '1'

JE DISPLAY\_M ; JUMP TO MAIN MENU IF EQUAL

OUTPUT MSG2 ; DISPLAY ERROR MESSAGE CRLF 13,10 ; MOVE TO THE NEXT LINE

JMP AGAIN\_W ; JUMP TO AGAIN\_W

DEL3:

MOV AL, M ; MOVE M TO AL

CMP AL, '0' ; COMPARE AL WITH '0'

JE NO\_M ; JUMP TO NO\_M IF EQUAL

CALL DEL\_M ; CALL DELETE MERCEDES PROCEDURE

CRLF 13,10 ; MOVE TO THE NEXT LINE

OUTPUT BAC ; DISPLAY BACK OPTION CRLF 13,10 ; MOVE TO THE NEXT LINE

MOV AH, 1 ; DOS FUNCTION TO READ A CHARACTER

INT 21H ; DOS INTERRUPT

CMP AL, '1' ; COMPARE AL WITH '1'

JE DISPLAY\_M ; JUMP TO MAIN MENU IF EQUAL

OUTPUT MSG2 ; DISPLAY ERROR MESSAGE CRLF 13,10 ; MOVE TO THE NEXT LINE

JMP AGAIN\_W ; JUMP TO AGAIN\_W

NO\_M:

CRLF 13,10 ; MOVE TO THE NEXT LINE

OUTPUT MSG17 ; DISPLAY NO MERCEDES RENTED MESSAGE

CRLF 13,10 ; MOVE TO THE NEXT LINE

OUTPUT BAC ; DISPLAY BACK OPTION CRLF 13,10 ; MOVE TO THE NEXT LINE

MOV AH, 1 ; DOS FUNCTION TO READ A CHARACTER

INT 21H ; DOS INTERRUPT

CMP AL, '1' ; COMPARE AL WITH '1'

JE DISPLAY\_M ; JUMP TO MAIN MENU IF EQUAL

OUTPUT MSG2 ; DISPLAY ERROR MESSAGE CRLF 13,10 ; MOVE TO THE NEXT LINE

JMP AGAIN\_W ; JUMP TO AGAIN\_W

DISPLAY\_D:

NOP ; NO OPERATION

CLEAR\_SCREEN 10H ; CLEAR THE SCREEN

CURSOR 01H,00H ; SET CURSOR TO THE BEGINNING OF THE SCREEN

JMP WHILE\_D ; JUMP TO WHILE\_D

**DELETE ENDP** 

DEL\_F PROC

DEC COUNT ; DECREMENT COUNT DEC F ; DECREMENT F

CRLF 13,10 ; MOVE TO THE NEXT LINE

OUTPUT MSG12 ; DISPLAY RECORD DELETED SUCCESSFULLY MESSAGE

RET ; RETURN FROM PROCEDURE

ENDP DEL\_F

DEL\_B PROC

DEC COUNT ; DECREMENT COUNT

DEC B ; DECREMENT B

CRLF 13,10 ; MOVE TO THE NEXT LINE

OUTPUT MSG12 ; DISPLAY RECORD DELETED SUCCESSFULLY MESSAGE

RET ; RETURN FROM PROCEDURE

ENDP DEL\_B

DEL\_M PROC

DEC COUNT ; DECREMENT COUNT

DEC M ; DECREMENT M

CRLF 13,10 ; MOVE TO THE NEXT LINE

OUTPUT MSG12 ; DISPLAY RECORD DELETED SUCCESSFULLY MESSAGE

RET ; RETURN FROM PROCEDURE

ENDP DEL\_M

END MAIN ; END OF THE MAIN PROGRAM

### **OUTPUT:**

• The main menu of the program provides users with options to rent a car, view the record, delete a record, or exit the program.

• The user chooses to delete the record without renting a car. As a result, the program prompts the user to rent a car first.

• The user chooses to rent a car, and as a result, three options are displayed on the screen, providing the user with the option to rent a Ferrari, rent a BMW, or rent a Mercedes. The per-hour rates are mentioned alongside each car.

• The user opts to rent a Ferrari for a duration of 2 hours. The program then computes the total rental cost and presents it on the screen.

• After returning to the main menu, the user selects the option to show the record. The record displays information such as the total number of vehicles rented, the total number of Ferraris, BMWs, and Mercedes rented, along with the total amount earned.

• The user attempts to delete the record of the BMW without renting it first. As a result, the program prompts that no BMW has been rented.

• After returning to the main menu, the user chooses to delete a record as the Ferrari has been returned. As a result, in the record section, the count of rented Ferraris decreases by one.

• The user rents three BMWs. However, when attempting to rent another BMW, the program indicates that all available BMWs are already rented. This limitation is due to the program allowing a maximum of three rentals for each type of car, including Ferrari, Mercedes, and BMW.

• The user rents a total of 9 cars, comprising 3 BMWs, 3 Ferraris, and 3 Mercedes. However, when attempting to rent another car, the program indicates that all available cars are already rented. This limitation exists because the program allows a maximum of three rentals for each type of car, including Ferrari, Mercedes, and BMW.

• The user decides to exit the program from the main menu, leading to the termination of the program.