Final Sprint Projects

April 4 – 18, 2025

- **All projects are to be completed in your Robot Groups. Submission for the group projects should be made by one person on behalf of the group. Project 4 – Obstacle Course – will be completed on the Robot Competition Day.**

- **All projects are due by Friday, April 18, 2025. Each project is to be attached to the assignment portal as in the past. The Robot Competition Day will be Friday, April 18, 2025. As projects are completed, post them to the portal so the instructors can get a start on the marking.**

- **There will be no classes during the final sprint. I will be at the school from 1 – 4 pm, and Vanessa will be available from 9 – 12 noon, each day to allow you to work with your robots and for questions.**

- **I expect each group will set up a Trello Board and have Daily Stand Ups.**

Project 1 – ERD and Report Design

The context of this problem is that a notional client, Harry Mackie, and his brothers Archie and Brian, have decided to open a small taxi stand (HAB Taxi Services – what a great name) in their town and asked for your help with the technology. All the brothers are mechanics so all maintenance will be performed in-house. They have a large garage between their homes (they are neighbors too) with a small build-out on the side that will be used as an office and command center. They have 4 cars that they are using in the business and rent out to drivers, while other employees use their own vehicles and pay stand fees.

A text file called Defaults.dat includes some values that will be used by the system. Values include the Next transaction number (143), the Next driver number (1922), the Monthly stand fee ($175.00) for drivers with their own car, the Daily rental fee ($60.00) and the Weekly rental fee ($300.00) for drivers who rent one of the company cars, and the HST rate (15%).

To keep track of drivers, set up an Employees table to store their driver number, name, address and phone number, drivers license number and expiry date, insurance policy company and policy number, a field to represent if they have their own car, and a field for their balance due – based on stand fees and rentals. Note that Harry, Archie, and Brian will also be set up as employees in this table.

A table is required to record any revenues from the company in a Revenues table. This table will include a Transaction ID, the date of the transaction, a brief description of the transaction, the driver number that generated the revenue, the amount of the transaction, the HST and the Total. NOTE: On the first day of each month stand fees are automatically charged to the drivers when the program is turned on, the balance due is updated in the employee table, and the revenue will be recorded in the revenue table.

Another table is required to record company Expenses for supplies and repairs to the company cars in an Expenses table. This table will include an Invoice number, an invoice date, the driver number that generated the expense, the item number, description, Cost, the Quantity, and the item total (Cost * Quantity) – NOTE: there could be multiple items entered on the invoice. Finally, the Subtotal, the HST and the Total will be added.

As drivers rent one of the company cars, we need to record the information to a Rentals table. The table will include a Rental ID, the driver number, the start date of the rental, the car number (1, 2, 3, or 4), whether the rental is for a day (from noon to noon the next day) or a week, the number of days (if they pick a week, it will appear as 7), the rental cost, the HST and the total. NOTE: this will update the balance due in the employees table above and add a record to the Revenue table as well.

As a driver makes a payment on their balance due, record the information to a Payment table. This will include a Payment ID, the driver number, the date of the payment, the amount of the payment, the reason for the payment, and the payment method (Cash, Debit, or Visa).

Create an ER Diagram based on the case study presented. Add one other feature to the ERD. It could be some new fields, a new table, or a combination of both. Add a description of what you did at the end of your ERD.

Design each of the following Reports / Receipts that are generated by the system. Place each of the designs on separate pages (Use Ctrl + Enter to move to the next page) after the ERD.

- As a driver rents a company car or makes a payment on their balance, the system must print a receipt. Make sure it clearly indicates the reason for generating the receipt.

- A Profit Listing is a report that is generated based on a Start and End Date – could be a single day, a month, or the entire year. Include all revenues and a total at the end of that part of the listing, then all expenses and a total for that part of the listing, and finally a calculated Profit (Loss) which is the total revenues less the total expenses. Include the date range as part of the headings.

- A Driver Financial Listing can be generated for any driver based on a Start and End Date. Prompt the user to enter an employee number and include all entries from the Revenue table for the driver between the dates specified. Include relevant totals at the end of the report. BONUS: include the employee name at the top of the report as well as the date range.

Project 2 – Some Python Code – I know you LOVE this.

The program will be set up to work from the following menu. There are enough options that someone can set up the menu and everyone can take a part or two from the menu options.

HAB Taxi Services
Company Services System

1. Enter a New Employee (driver).
2. Enter Company Revenues.
3. Enter Company Expenses.
4. Track Car Rentals.
5. Record Employee Payment.
6. Print Company Profit Listing.
7. Print Driver Financial Listing.
8. Quit Program.

Enter choice (1-8):

Create the defaults file as described in the case study. At the beginning of this program, read the values from the defaults file and write the values back at the end of the program.

Remember how I said programmers hate the word "Automatically" – Prepare the following code as part of the project. On the first day of each month stand fees are automatically charged to the drivers with their own car when the program is turned on, and the revenue will be recorded in the revenue table. A sample record in the revenue table would appear as follows.

143, 2022-04-01, Monthly Stand Fees, 1918, 175.00, 26.25, 201.25

It was mentioned that this would also update the balance due in the employees table – Place a comment indicating that the Balance Due would be updated now – this update does not need to be coded – it is quite tricky with text files – BONUS point if you can figure it out (Remember this is a text file). Prepare the code to apply stand fees on the first day of the month and write the record to the revenue table.

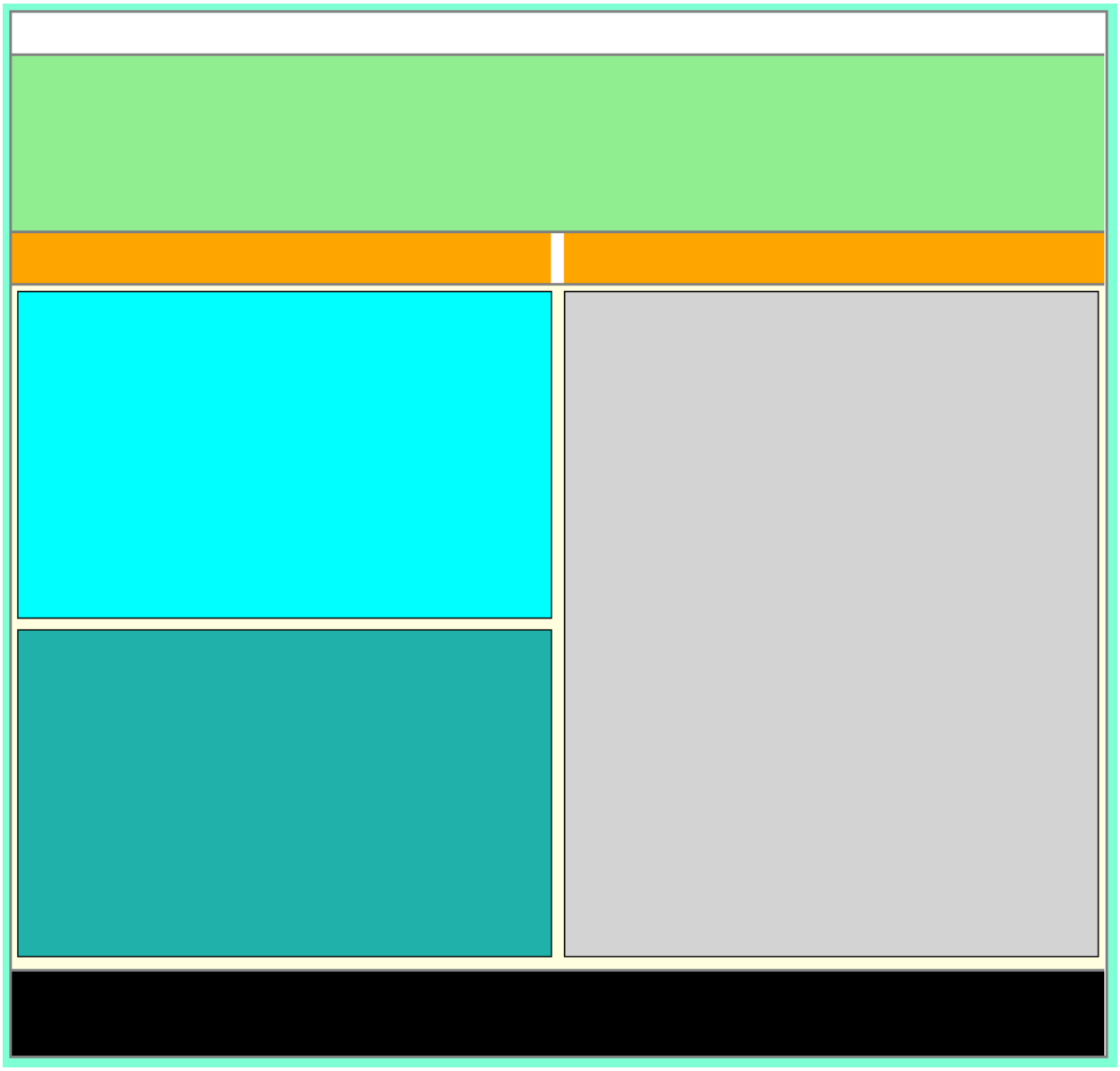
From the menu, complete the code for **Option 1, OR 2, OR 3** – Did you notice the word **OR** - just one is required to be coded. Based on your ERD, design, and code a text-based interface. Add some calculated fields and display the results once the inputs are complete and write the values to the appropriate files. The data files for Options 1, 2 and 3 (including the option from the previous step) should be created. Just create the data files for the other options not created in the previous step. Add up to 5 - 6 records in the Employee table, and 10 - 20 records in the revenue and expenses tables.

Option 4 will track cars that are rented by drivers. **Option 5** will allow payments from drivers and employees on their accounts. Use any extra data files you may require. Set up interactive screens for the user input, and prepare a professional output for each.

Write the code for **Options 6 and 7** based on the designs you created in the first project.

Project 3 - JavaScript

Use the following template (provided) to complete the JavaScript portion of the Final Sprint. Change all the background color (except for the footer) as sections are complete to match a theme for the page. You can adjust heights, padding, or margins of the sections as required.



- The top white bar (Part of the header) will contain a message. The message will read "Good Xxxxxxxxx - Quote - Date". The message will be Good Morning, Good Afternoon, Good Evening, or Good Night based on the hour. The quote is your choice – could be company

based or an inspirational message. The date is the last section in the format of choice. Extra – use an array and a random number to change the quote as the page refreshes.

- The banner will be a slideshow. Create 4 – 5 images based on a theme and cycle through every 4 – 5 seconds. NOTE: may need to crop images to get the proportion (~1000 x 150).

- The left side of the navigation bar will contain links for: Home Services About Contact. Set up appropraite styles for the links to match the theme of the page. The right side of the navigation bar is for an option of your choice – researching something new would be amazing. It could be HTML or JavScript – again make it match the theme of the page.

- In the main section there are 3 divs. The top left will show a button in the top left corner that reads "Tell Me a Story". On a click of the button, prompt the user to enter several values and write a story to fill the block using the prompt values and other text as required. Add some html tags to emphasize some of the text.

- The right side will also show a button that reads Loan Analysis in the top left corner and when it is clicked will generate results (4 column – design the receipt on the sample below).

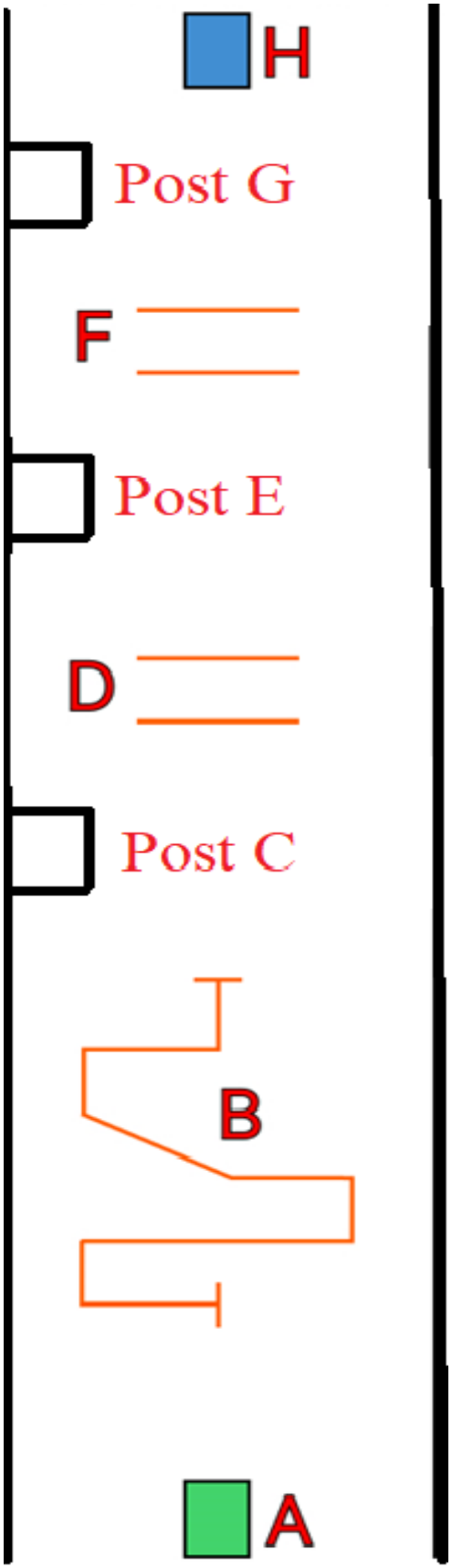
  Prepare a program that will allow the user to enter a loan amount, and the reason for the loan. Create a loop that will execute for the number of Years between 1 and 10. For each year, calculate simple interest using the equation I = PRT where P is the amount of the loan, R is the interest rate, and T is the number of years. Add the interest to the loan amount for the total amount to be repaid. Finally, calculate the monthly payment by dividing the amount to be repaid by the number of months (years multiplied by 12). Print the year, the loan amount, the total to be repaid, and the monthly payment for each year. Use a standard interest rate of 5.2% per year. At the end of the table, prompt the user to enter the number of years they want to choose to pay the loan and print the value after the table.

```
Loan Analysis Statement

10 Year options for loan of $#,###.##
Reason: Xxxxxxxx Xxxxxxxxx Xxxxxxxxxx (Note the title case)
Statement date: Current Date (Format of choice)

Years  Interest  Total Amt  Mon Payment
---------------------------------------
 ##   $#,###.##  $#,###.##   $#,###.##
                                :
 ##   $#,###.##  $#,###.##   $#,###.##
---------------------------------------
Payback option selected:      ## Years
```

- Finally, in the bottom left div, add a new feature of JavaScript that is researched. It can be generated based on a click of a link or button, or displayed as the page loads. Have fun.

- Add some contact to the footer section – look up some footers and see what type of info is generally included. Again, match the theme of your site.

Project 4 – Robot Obstacle Course



You job is to position your robot in at each performance point (A – H) and perform the following. Position the robot to the start position (A). Note that at each horizontal line, it is a reset point – you can sleep for 5 seconds to allow you to reset the position of the robot.

At position B – follow the line to bring the robot to the top horizontal line. This is a Reset point.

Each Post (C, E, and G) will have a marker of F, D, or P indicating the room type. If it is a F, there is a fire – find the marker and shoot it. Type D is Dangerous – skip the post and continue. Finally, a type of P has a person and must be returned to safety (Back to A – then return to the post). Note that each post can be F, D, or P.

On the way up the hall, bypass position D – you can, however, use this as a Reset Point.

At position F, there will be a marker with 1, 2, or 3 on the wall. If the marker is a 1, do something with the Chassis and Gimbal, if the marker is a 2 do something with the LED lights, if it is a 3, do both the Chassis and Gimbal and the LED lights. Again, this can change each run. This is also a reset point.

Position H is the turn around point. This is also a reset point.

On the way back to the start, at Position D, research something you can do with the robot and implement it here. This will also be the final reset point on the way back to the Start Position (A) for the end of the course. You are not required to do the zigzag again – just go straight through.

The Robot competition will be held on Friday, April 18. There will be a first run at 11:00 am, then pizza for lunch supplied by the school, and a second run (or partial run) for those who need it at 1:00 pm.

Obstacle Course Notes

The post types can be changed before you run the course for many different alternatives. Any post can be either F, D, or P and can be changed during the run for each group. Make sure the actions at each post match the target.

Suggested processes – not that anyone really listens to any of my suggestions:

1. Take measurements in the main hall – stop at all points – turn 90 degrees when you get to a post so that you are pointing at it. Test the main hall code.

2. Set up sleep timers for 5 seconds at each horizontal line – at B, D, F, and H on the way up or down the hall. As you find a person at a post and return to the start, position A will also be a reset point. Test the sleep points.

3. Position the robot approximately 3 feet in front of the markers on the posts. Test positions at each marker.

4. Write the code to scan for Fire, Person, or Poison – test each post for all room types. Test each post for each of the markers.

5. Have fun!