UNIVERSITI TEKNOLOGI MARA
FINAL EXAMINATION

COURSE	:	**PROGRAMMING PARADIGMS**
COURSE CODE	:	**CSC305**
EXAMINATION	:	**FEBRUARY 2023**
TIME	:	**3 HOURS**

INSTRUCTIONS TO CANDIDATES

1. This question paper consists of five (5) questions.

2. Answer ALL questions in the Answer Booklet. Start each answer on a new page.

3. Do not bring any material into the examination room unless permission is given by the invigilator.

4. Please check to make sure that this examination pack consists of:

   i. the Question Paper
   ii. an Answer Booklet – provided by the Faculty

5. Answer ALL questions in English.

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO

This examination paper consists of 8 printed pages

QUESTION 1

a) Functional programming is an active area of research in the field of programming language theory.

i. List down **TWO (2)** key concepts of Functional Programming and give an example of Functional programming language.

(3 marks)

ii. Show the output of the given Scheme expressions below:

1. `(car (cdr (car '('(a b c) '(d e f) '(g h i )))`
2. `(cons '(1 2 3 4 5) '(6 ( 7 8) 9)`

(2 marks)

b) Scheme is primarily a functional programming language.

i. Convert the following mathematical equations below into Scheme expressions:

1. $(a - b) / (5a)$
2. $\sqrt{(254 / 3x)}$

(4 marks)

ii. Analyze the following Scheme expression and convert them to mathematical equations.

1. `(define (f1 m n) (+ (*m m) (* n n n)))`
2. `(define (f2 x y) (- (* 3 (f1 m n)) 5))`

(4 marks)

c) Based on the problem below;

i. Write a Scheme function that displays the respective grade and status according to the marks given in the table below.

Marks	Grade	Status
80 – 100	A	Pass
65 – 79	B	Pass
50 – 64	C	Pass
40 – 49	D	Fail
30 – 39	E	Fail
0 – 29	F	Fail

(4 marks)

ii. Banana chip sellers sell their products cheaper if buyers buy in bulk. To buy less than 50 kg of banana chips worth RM 40. If you buy more than 50 kg but less than 100 kg, the price offered is RM 35 per kg. If you buy more than 100 kg, the price is RM 30 per kg. Write the Scheme function that takes the kilogram of ordered and return the total price.

(5 marks)

QUESTION 2

a) Recent survey of public rating and typical price of top five delicacies in Sarawak yielded following findings. In Prolog facts, these findings are written as below.

```
topfivedelicacies('Laksa Sarawak',5.0, 10.50).
topfivedelicacies('Kolo Mee',4.9, 5.0).
topfivedelicacies('Pucuk Midin',4.8, 15.0).
topfivedelicacies('Manok Pansuh',4.7, 18.0).
topfivedelicacies('Umai',4.6, 20.0).
```

i. Write a query that will display the rating and price of Laksa Sarawak.

(1 mark)

ii. Write a query to find delicacies with price less than 10.0.

(2 marks)

iii. Write a query that will display all the delicacies of any price with rating higher than 4.7.

(2 marks)

b) Amateur photographers often start with entry level camera. Table 1 shows the top 5 entry level DSLR cameras recommended for photography enthusiast.

Table 1: Top 5 entry level DSLR cameras

Brand	Model	Price (RM)	Sensor (MP)	Maximum video resolution
Nikon	D3500	3550	24.2	1080p
Canon	250D	3020	24.1	4K
Canon	850D	3890	24.1	4K
Nikon	D5600	3456	24.2	1080p
Canon	2000D	2280	24.1	1080p

i. Construct appropriate **Prolog** statements that represent facts shown in Table 1.

(5 marks)

ii. Based on your answer in (i) above, write a Prolog query that will list down all information of camera model 850D.

(1 mark)

iii. Based on your answer in (i) above, write a **Prolog** query that will display all models with price less than RM3500 and maximum video resolution 4K.

(2 marks)

c) The top 10 most livable cities in 2022 and their brief information are shown in Table 2.

Table 2: Top 10 most livable cities in 2022

City	Population/m	Area/km^2	Country	Rating
Vienna	1.897	414.6	Austria	99.1
Copenhagen	0.603	179.8	Denmark	98.0
Zurich	0.403	87.88	Switzerland	96.3
Calgary	1.336	825.3	Canada	96.3
Vancouver	0.675	115	Canada	96.1
Geneva	0.199	15.93	Switzerland	95.9
Frankfurt	0.753	248.3	Germany	95.7
Toronto	2.930	630.2	Canada	95.4
Amsterdam	0.821	219.3	Netherlands	95.3
Osaka	2.691	223	Japan	95.1

The **Prolog** facts of these 10 cities are given below:

```
top10livablecities(vienna, 1.897, 414.6, austria, 99.1).
top10livablecities(copenhagen, 0.603, 179.8, denmark, 98.0).
top10livablecities(zurich, 0.403, 87.88, switzerland, 96.3).
top10livablecities(calgary, 1.336, 825.3, canada, 96.3).
top10livablecities(vancouver, 0.675, 115, canada, 96.1).
top10livablecities(geneva, 0.199, 15.93, switzerland, 95.9).
top10livablecities(frankfurt, 0.753, 248.3, germany, 95.7).
top10livablecities(toronto, 2.930, 630.2, canada, 95.4).
top10livablecities(amsterdam, 0.821, 219.3, netherlands, 95.3).
top10livablecities(osaka, 2.691, 223, japan, 95.1).
```

i. Create a **Prolog** query to list the cities that have rating higher than 96.

(2 marks)

ii. Create a **Prolog** rule for finding the city with highest population density.

(3 marks)

iii. Kuala Lumpur is named as the most livable city for expats in 2022. Data from 2018 showed that the rating for Kuala Lumpur was 73.6. Create a **Prolog** rule to show the city's name and calculate rating difference between Kuala Lumpur and the cities in Canada.

(4 marks)

QUESTION 3

a) Based on the following C program :

Line	Code
1	`#include <stdio.h>`
2	`int main()`
3	`{`
4	`int x;`
5	`float y;`
6	`printf("Input total distance in km: ")`
7	`scanf("%d",&x);`
8	`printf("Input total fuel spent in litres: ");`
9	`scanf("%d", &y);`
10	`printf("Average consumption (km/lt) %.3f ",x/y);`
11	`printf("\n");`
12	`return 0;`
13	`}`

i. Identify **TWO (2)** syntax errors and fix the errors by rewriting the statements.

(2 marks)

ii. Trace the output of the program after the syntax errors are corrected.

(3 marks)

b) Anggun Cookies produces and sells flour-based-food such as cookies, cakes, and pastries. Write a C segment code using nested if...else statement that will calculate and display the total price for three (3) types of cakes produced by Anggun Cookies. Error messages will be displayed for invalid input. Use the following table as a reference to calculate and display the total price

Item Code	Types of Cakes	Number of Box	Price (RM) Per Box
A	Almond Batek	1 - 20	RM 15.00
		> 20	RM 13.50
C	Cranberry Batek	1 - 20	RM 16.00
		> 20	RM 14.50
M	Milky Horlick Batek	1 - 20	RM 17.00
		> 20	RM 15.50

(8 marks)

c) Rewrite this C program by using functions named `getInput()` and `calculateX2()`. Function `getInput()` will read in the input and returns the input to the calling function. While function `calculateX2()` will calculate the value for `x2`, where it must have one parameter and it returns the calculated result to the calling function.

```
#include <stdio.h>
int main()
{
float x1,x2 ;
printf("Please enter the value of X1 = ");
scanf("%f", &x1);
x2 = 10 * x1 - 1;
printf("The value of X2 = %.2f\n", x2);
return 0;
}
```

(8 marks)

QUESTION 4

a) What is an access modifier in Java programming language? Explain any **TWO (2)** examples of access modifiers.

(5 marks)

b) Write a class definition (ADT) in Java programming language that contains the following attributes, default constructor and mutator methods of a class named Songs.

Class: Songs

Attributes: Songs ID //type of integer
Song's title //type of string
Singer's name // type of string
Song's year // type of integer. Eg: 2020
Song's origin // type of boolean, either originated from local (true) or I international (false)

(5 marks)

c) Given the following classes (ADT) named Student and PartTimeStudent.

Class : Student	**Class : PartTimeStudent**
Attributes : studID as integer studName as string studSpecialization as string //ST or SS studGender as string	**Attributes :** ptstudGovernment as boolean ptstudMaritalStatus as boolean ptstudAddress as string

Method :
`getStudSpecialization()`
	Method :
	`getPtStudGov()`
	`calcFee()`

Based on the above classes, write a function definition in Java programming language for the processor named `calcFee()` to calculate the university fees that should be paid by each student. The ST (Science and Technology) student should pay RM1000 per semester, while the SS (Social Science) is RM800 per semester. A 5% discount will be deducted if the students are from the government sector.

(5 marks)

QUESTION 5

a) List and explain **THREE (3)** characteristics of scripting paradigm. Give **TWO (2)** examples of programming language that support scripting paradigm.

(5 marks)

b) Consider the following **Python** code segment that execute a block of code among three alternatives to classify number received from user.

```
number = int("Enter a number")

if number > 0
print("Positive number")

else if number = 0:
    print(Zero)
else:
    print('Negative number')
```

i. Identify **SIX (6)** errors in the code and suggest correct code to replace the errors.

(6 marks)

ii. Predict output for the above code if value 0.5 is input by the user.

(1 mark)

c) Based on the given **Python** line of code, answer the following questions:

```
paradigms = ['logic', 'scripting', 'imperative', 'functional']
```

Write statements for the following:

i. To display all paradigms.
ii. To display the first **TWO (2)** paradigms.
iii. To display the paradigm which starts with letter f.
iv. To add "object oriented" to the list of paradigms.
v. To delete "logic" from the list.
vi. To sort items in the list in ascending order.

(8 marks)

END OF QUESTION PAPER