UNIVERSITI
TEKNOLOGI
PETRONAS

# FINAL EXAMINATION
# SEPTEMBER 2024 SEMESTER

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| **COURSE** | **:** | **TEB2132 - STRUCTURED PROGRAMMING & DATABASE SYSTEM** |
| **DATE** | **:** | **10 DECEMBER 2024 (TUESDAY)** |
| **TIME** | **:** | **2:30 PM - 4:30 PM (2 HOURS)** |

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**INSTRUCTIONS TO CANDIDATES**

1. Answer **ALL** questions in the Answer Booklet.
2. Begin **EACH** answer on a new page in the Answer Booklet.
3. Indicate clearly answers that are cancelled, if any.
4. Where applicable, show clearly steps taken in arriving at the solutions and indicate **ALL** assumptions, if any.
5. **DO NOT** open this Question Booklet until instructed.

**Note** :

i. There are **NINE (9)** pages in this Question Booklet including the cover page .

ii. **DOUBLE-SIDED** Question Booklet.

1. a. Write a C++ statement to accomplish each of the following:
[**NOTE:** You do not need to write a full C++ code.]

i. Prompt the user to enter an integer by ending your prompting message with a colon, ":", followed by a space and let the cursor positioned after the space.

[3 marks]

ii. Assign the sum of `x` and `y` to `z` and increase the value of `x` by 1 after the assignment.
[**NOTE:** Use post-increment.]

[3 marks]

b. Convert the following equations into their respective C++ expressions:

i. $$y = \frac{80w + 7 - z}{18m}$$

[3 marks]

ii. $$T = xy - \frac{w}{z}$$

[3 marks]

c. Given the variable declarations and assignment statements as shown in **FIGURE Q1**.

```
double x, y;
int a, b, c;
x = 10;
y = 20;
a = 1;
b = 2;
c = 3;
```

**FIGURE Q1**

Evaluate the following expressions:

i. `x + b / 2 * y + (c - a)`

[4 marks]

ii. `a * c || y - x >= a`

[4 marks]

2. a. Body Mass Index (BMI) is a number calculated based on a person's weight and height. You are to write a C++ program to calculate the BMI for 10 adults based on their entered height and weight. The formula for BMI is:

$$BMI = \frac{weight}{height^2}$$

From the calculated BMI of each adult, determine whether the person is underweight, normal, overweight, or obese based on the information in **TABLE Q2**.

**TABLE Q2**

| BMI | Weight Status |
|---|---|
| Below 18.5 | Underweight |
| 18.5 – 24.9 | Normal |
| 25.0 – 29.9 | Overweight |
| 30.0 and above | Obese |

[10 marks]

b. Change the inner `for` loop in the code fragment shown in **FIGURE Q2b** to `while` loop.

```
for (x = 20; x >= 1; x--)
{
    for (y = x; y >= 1; y--)
        cout << "*";

    cout << x << " star(s) \n";
}
```

**FIGURE Q2b**

[5 marks]

c. Trace the code fragment shown in **FIGURE Q2c** and write the output produces by this code.

```
int main(void)
{
 int k = 3, n = 8, i, s = 0;

 for(i=1;i<=n;i++)
 {

     if((i%k) == 0)

         s = s + i;

 }
 cout << "Result = " << s;

}
```

**FIGURE Q2c**

[5 marks]

3. a. Identify with justification whether it is valid or invalid for each of the following array initialization statements.

i. `int ary[5]= [1, 2, 3, 4, 5];`

[2 marks]

ii. `int ary[ ] = {1, 2, 3, 4};`

[2 mark]

b. Identify the output from the program code in **FIGURE Q3b**.

```
#include <iostream>
using namespace std;
int main(void)
{
     int list [10] = {2, 1, 2, 1, 1, 2, 3, 2, 1, 2};
     cout << "\n" << list [2];
     cout << "\n" << list [list [2]];
     cout << "\n" << list [list [2] + list [3]];
     cout << "\n", list [list [list [2]]];
     return 0;
  }
```

**FIGURE Q3b**

[8 marks]

c. Trace the program in FIGURE Q3c and state the outputs it produces.

```
int i, j, temp[8];
vector<int>num;
for(i = 5; i >= 0; i--)
            temp[i] = 3*i;
for(i = 0; i < 6; i = i+2)
            num.push_back(temp[i]);
for(i = 0; i < 6; i = i+2){
            for(j = 0; j < num.size(); j++){
                  cout << temp[i] + num[j] << " ";
            } cout << endl;
}
```

**FIGURE Q3c**

[8 marks]

4. In a robotic competition, you are required to determine the speed of a robot movement based on the colour of the controller buttons as follows:

- Green – increase the current speed by 2
- Yellow – decrease the current speed by 2 if the current speed is not zero
- Red – stop the robot

a. Draw a complete flowchart to show how you can fulfil the required control tasks.

[7 marks]

b. Write a C++ code using the if...else structure based on the flowchart in part (i).

[8 marks]

c. Rewrite the C++ code in part (ii) using switch structure.

[5 marks]

5. a. Describe a file stream C++ programming.

[4 marks]

b. Write a C++ program to read a series of integers from a text file named `Numbers.txt` and display the smallest integer in the file.

[10 marks]

c. Shows the output produced by of the program code in **FIGURE Q5**.

```
#include <iostream>

using namespace std;

int global_var = 10;

int main() {
  int local_var = 5;
  cout << "Inside main: global_var = " << global_var << endl;
  cout << "Inside main: local_var = " << local_var << endl;
  {
     int local_var = 20;
     cout << "Inside inner block: local_var = " << local_var << endl;
     cout << "Inside inner block: global_var = " << global_var;
     cout << endl;
    }
  cout << "Outside inner block: local_var = " << local_var << endl;
  cout << "Outside inner block: global_var = " << global_var << endl;

  return 0;
}
```

**FIGURE Q5**

[6 marks]

- END OF PAPER -