



THE PAPUA NEW GUINEA UNIVERSITY OF TECHNOLOGY
DEPARTMENT OF ELECTRICAL AND COMMUNICATIONS
ENGINEERING

FINAL EXAMINATION (2022)
SEMESTER 1

EN212 – Introduction to Programming in C
SECOND YEAR (ELECTRICAL) BEEL 2

TIME ALLOWED: 3 HOURS

INFORMATION FOR STUDENTS

1. You have **TEN (10) MINUTES** to read the paper.
You must not begin writing during this time.
2. **Answer all questions.**
3. All answers must be written in the **ANSWER BOOK** supplied.
4. **COMPLETE THE DETAILS REQUIRED ON THE FRONT COVER OF YOUR ANSWER BOOK – DO THIS NOW.**
5. Textbooks and laptops **ARE** permitted.
6. If you are found cheating in the Examination, the penalties specified by the University shall apply.
7. **TURN OFF** all Mobile Phone and place them on the floor under your seat before the start of Examination

Question 1 True of False [10 Marks]

Which of the following is true for the c programming language

1. The code "typedef int x;" is a variable declaration.	[True False]
2. The code "png" is a keyword.	[True False]
3. A character value is just an integer value.	[True False]
4. An expression can update and return the value of a variable at the same time	[True False]
5. The size of pointers are the same regardless of CPU architecture.	[True False]
6. A string of 3 characters occupies 3 bytes.	[True False]
7. All string variables are pointers.	[True False]
8. A signed and unsigned integer are of the same memory size.	[True False]
9. Any looping blocks can be implemented using recursion.	[True False]
10. Recursion calls may continue forever like infinite loops.	[True False]

Question 2: Multiple Choices [10 Marks]

<p>1. Which one of the following keywords refers to a loop?</p> <ul style="list-style-type: none">A) IfB) switchC) returnD) whileE) goto	<p>6. Which of the following will test if the 6th bit is turned off</p> <ul style="list-style-type: none">A) $N 0x20$B) $N \& 0x20$C) $N \wedge 0x20$D) $N \ll 0x20$E) $N \gg 0x20$
<p>2. Which one of the following statements can result in spaghetti code?</p> <ul style="list-style-type: none">A) IfF) switchG) returnH) whileI) goto	<p>7. Which of the following will return a remainder of a number</p> <ul style="list-style-type: none">A) n / dB) $n \% d$C) $n \gg d$D) $n \& d$E) $n d$
<p>3. Which of the following is a pointer?</p> <ul style="list-style-type: none">A) Char *nJ) Char **nK) Char ***nL) Char ****nM) All off the above	<p>8. Which of the following will switch the 2nd bit</p> <ul style="list-style-type: none">A) $N 0x2$B) $N \& 0x2$C) $N \wedge 0x2$D) $N \ll 0x2$E) $N \gg 0x2$
<p>4. For a 16 bit CPU, what is the size of a long pointer?</p> <ul style="list-style-type: none">A) 1 byteN) 2 bytesO) 4 bytesP) 8 bytesQ) 16 bytes	<p>9. Which of the following represents an array of 5 elements</p> <ul style="list-style-type: none">A) char i = 5B) char *i = 5C) char i[] = {0, 1, 2, 3, 4, 5}D) char *i[] = {0, 1, 2, 3, 4, 5}E) "five"
<p>5. Which of the following is the quickest in multiplying a number by 2?</p> <ul style="list-style-type: none">A) $n + n$R) $n * 2$S) $2 \ll n$T) $n \ll 2$U) $n \gg 2$	<p>10. Which of the following expression is not equivalent</p> <ul style="list-style-type: none">A) "abc" vs {'a', 'b', 'c'}B) $0x05$ vs 5C) $1 0$ vs $5 0$D) 'a' vs 'b'-1E) non of the above

Question 3: Loops and Recursion [10 mark]

The mathematical expression denotes the summation of a finite series:

$$y=3 \sum_{n=0}^k \frac{n^2+n+3}{(n+1)^2}$$

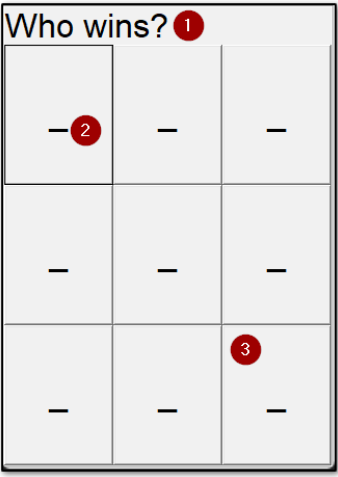
Implement the following function:

```
double y(int k)
{
    // implement your code here:
}
```

- A) [5 marks] Using loop statement(s).
- B) [5 marks] Using recursion only.

Question 4: IUP Programming 1 [10 Marks]

Tic-tac-toe is a game for two players who take turns marking the spaces in a three-by-three grid with “X” or “O”. The player who succeeds in placing three of their marks in a horizontal, vertical, or diagonal row is the winner. Below is the mock-up of the user interface:

	<p>Keys:</p> <ol style="list-style-type: none">1. A IupLabel where the font is set to "Arial, 24"2. IupButton(s) where the font is set to "Arial, 24", and ...3. the size for each of them is set to 30 x 30
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Assuming the function:

```
Ihandle *tic_tac_toe_dialog()
```

creates such UI layout, implement the function so that:

1. [2 marks] Fonts of the label and buttons are set to “Arial, 24”
2. [2 marks] The buttons’ “TITLE” is set to “_” (underscore)
3. [2 marks] The buttons’ “id” attribute is set to an integer value from “0” (for the first button located on the top-left corner) to “8” (for the last button located on the bottom-right corner).
4. [2 marks] The titles’ “TITLE” is set to “Who wins ?” (underscore)
5. [2 marks] the titles of the label and buttons are arranged in the orientation as shown in the diagram above by using **IupVbox(s)** and **IupHbox(s)** appropriately.

Question 5: IUP Programming 2 [10 Marks]

Assuming the function:

```
int btn_click(*Ihandle btn)
```

is called when a button is clicked on, implement the function so that:

1. [2 marks] When the click is “odd” (i.e. the 1st, 3rd, 5th, etc clicks) will change a button’s “TITLE” from “_” to “X”.
2. [2 marks] When the click is “Even” (i.e. the 0th, 2nd, 4th, etc clicks) will change a button’s “TITLE” from “_” to “O”.
3. [1 mark] Clicks on buttons with their “TITLE” already set to “X” or “O” are ignored.
4. [3 marks] If a winner is found set the label to either “O has won” or “X has won”
5. [2 mark] When all buttons are either “O” or “X” and no winner was found then set label to “Its a draw”

Hints:

- For Question 1 and 2, try use a static variable to track the click count.
- The label GUI can be located by using the “IupGetDialog” and “IupGetChild” functions.