



Eastern Mediterranean University  
Department of Computer Engineering

**CMPE 108 – Algorithms and Programming**  
**Midterm Exam, 2021-2022 Spring Semester**  
**April 26, 2022**  
**Duration: 90 minutes**

Name Surname: .....

Student No : ..... Signature :.....

**Instructions:**

- There are **5** questions in **7** pages including the cover page.
- Calculators, mobile phones and any electronic devices are **NOT** allowed.
- A table of operators for precedence and associativity is attached on Cover Page.
- Passing any material including rubbers, pencils etc. to anybody else is strictly prohibited in the exam.
- Asking questions to invigilators is prohibited. The instructors will visit the exam rooms regularly.

|                   |                   |                    |                    |                    |              |
|-------------------|-------------------|--------------------|--------------------|--------------------|--------------|
| <b>Q1 (7 pts)</b> | <b>Q2 (24pts)</b> | <b>Q3 (29 pts)</b> | <b>Q4 (20 pts)</b> | <b>Q5 (20 pts)</b> | <b>Total</b> |
|                   |                   |                    |                    |                    |              |

**PRECEDENCE AND ASSOCIATIVITY TABLE**

| Operators              | Associativity         |
|------------------------|-----------------------|
| ( ) [ ] -> .           | Left to right         |
| ! ++ -- + - * & (type) | Right to left (Unary) |
| * / %                  | Left to right         |
| + -                    | Left to right         |
| < <= > >=              | Left to right         |
| == !=                  | Left to right         |
| &&                     | Left to right         |
|                        | Left to right         |
| ?:                     | Right to left         |
| = += -= *= /= %=       | Right to left         |
| ,                      | Left to right         |

**% specifiers in ANSI C:**

|  |   |
|--|---|
| %c char single character                         | %o int unsigned octal value             |
| %d (%i) int signed integer                       | %p pointer address stored in pointer    |
| %e (%E) float or double exponential format       | %s array of char sequence of characters |
| %f float or double signed decimal                | %u int unsigned decimal                 |
| %g (%G) float or double use %f or %e as required | %x (%X) int unsigned hex value          |

**Q1) [7 pts] Multiple choice questions. Circle the correct answer.**

- i) Which of the following is not a kind of memory?**
- a) RAM
  - b) ROM
  - c) Cache
  - d) Central Processing Unit
- ii) Which of the following is a correct abbreviation for ROM?**
- a) Raw Overflow Matrix
  - b) Read Only Memory
  - c) Row Only Memory
  - d) Read Only Machine
- iii) Which of the following is a correct statement?**
- a) The smallest data inside a computer is called a byte
  - b) The largest data inside a computer is called giga byte
  - c) The largest data item inside a computer is called mega byte
  - d) The smallest data inside a computer is called a bit
- iv) Which of the following is not an operating system?**
- a) Windows
  - b) GHz
  - c) Mac OS X
  - d) Linux
- v) Which of the following is not an output device?**
- a) Monitor
  - b) Speaker
  - c) Earphones
  - d) Microphone
- vi) Which of the following is not an input device?**
- a) Digital camera
  - b) Mouse
  - c) Printer
  - d) Scanner
- vii) Which of the following is a correct statement?**
- a) A computer performs four major functions such as input, output, processing and storage
  - b) RAM type memory provides permanent storage regardless of electricity cut
  - c) The software components of a computer are electronic and physical parts
  - d) The hardware components of a computer are data and computer programs

**Q2) Determine the output of the following C program segments.**

**a) [3 pts] What is the value of k?**

```
int i, j, k;
i = 3;
j = 5;
k = i > j ? i : j;
```

**k= .....5.....**

**b) [3 pts] What is the value of k?**

```
int i, j, k;
i = 3;
j = 5;
k = (i >= 0 ? i : 0) + j;
```

**k= .....8.....**

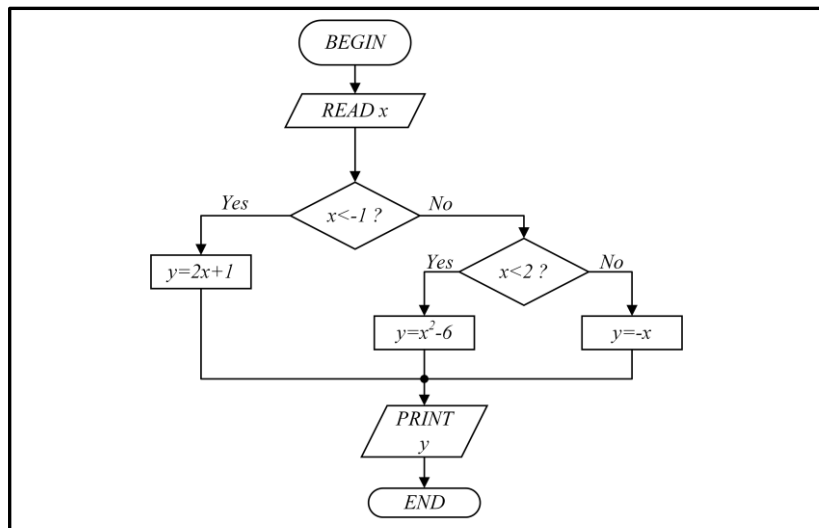
**c) [8 pts] Determine the output of the following C program for age=65.**

```
int age, age1=25, age2=45, age3=65, age4=85;
printf("Enter your age: ");
scanf("%d", &age);
if (age<age1)
    printf("You are very young\n");
else if (age<age2)
    printf("You are young\n");
else if (age<age3)
    printf("You are not that old\n");
else
    printf("You are old\n");
```

**Output: You are old**

**d) [10 pts] Consider the following funtion. Draw a flowchart to calculate and display the value of y. Assume that the value of x is read via keyboard.**

$$y = \begin{cases} 2x+1 & , \quad x < -1 \\ x^2 - 6 & , \quad -1 \leq x < 2 \\ -x & , \quad x \geq 2 \end{cases}$$



Q3) a) [5 pts] State which of the following C identifier names are valid or invalid. Give reason if invalid.

| Identifier  | Valid/Invalid | Reason               |
|-------------|---------------|----------------------|
| Step#1      | Invalid       | Includes # character |
| 7th_Street  | Invalid       | Starts with a number |
| DeValuation | Valid         |                      |
| next_level  | Valid         |                      |
| Radius1     | Valid         |                      |

b) [8 pts] Write down the equivalent mathematical expression for each C expression shown below.

i)  $m = (8 * n * n / 7) / (1/3 + n)$

$$m = \frac{8n^2}{\frac{1}{3} + n}$$

ii)  $c = (a + b) / a * b - b / 7$

$$c = \frac{a + b}{ab} - \frac{b}{7}$$

c) [8 pts] Without using unnecessary paranthesis, write down the equivalent C expression for each mathematical expression shown below.

i)  $c = 5b(a - 8b) + 4a - 2$

$$c = 5 * b * (a - 8 * b) + 4 * a - 2$$

ii)  $y = \frac{4x^2}{\frac{3}{6x+7}} + 8x^3$

$$y = (4 * x * x / 3) / (6 * x + 7) + 8 * x * x * x$$

d) [8 pts] For the following display outputs fill in the blanks of the printf statements to get the output exactly as given below.

```
int a=21, b=5;
float c=68.27, d=0.002183;
```

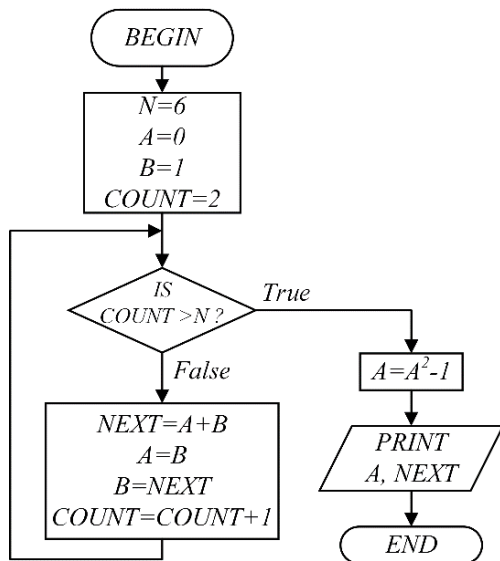
a) `printf("%-3d%5d", a,b);`    **2 1**    **5**

b) `printf("%8.2e", d);`    **2 . 1 8 e - 0 3**

c) `printf("%6.3f", c);`    **6 8 . 2 7 0**

d) `printf("%d%f", b,c);`    **5 6 8 . 2 7 0 0 0 0**

**Q4) [20 pts]** Trace the following flowchart. Record all steps into the trace table and determine the printed value of SNUM.



**Trace Table:**

| N        | NEXT     | A         | B        | COUNT    |
|----------|----------|-----------|----------|----------|
| <b>6</b> |          | <b>0</b>  | <b>1</b> | <b>2</b> |
|          | <b>1</b> | <b>1</b>  | <b>1</b> | <b>3</b> |
|          | <b>2</b> | <b>1</b>  | <b>2</b> | <b>4</b> |
|          | <b>3</b> | <b>2</b>  | <b>3</b> | <b>5</b> |
|          | <b>5</b> | <b>3</b>  | <b>5</b> | <b>6</b> |
|          | <b>8</b> | <b>5</b>  | <b>8</b> | <b>7</b> |
|          |          | <b>24</b> |          |          |
|          |          |           |          |          |
|          |          |           |          |          |
|          |          |           |          |          |

**A=.....24.....**

**NEXT=....8.....**

**Q5) a) [10 pts] What is the output of the following code for each input?**

| <pre> int X, Y=27; printf("Enter a value for X &gt;0"); scanf("%d", &amp;X); switch(X) {   case 0:     printf("Pass\n");     break;   case 1:     X=Y%12;     printf("%d\n",X);     break;   case 2:     printf("%d\n",X+Y);     break;   case 3:   case 4:     printf("Stop");     break;   case 5:     Y/=2;   default:     ++X;     printf("%d\n",Y-X); } </pre> | <table border="1"> <thead> <tr> <th>Input (X)</th> <th>Output</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Pass</td> </tr> <tr> <td>1</td> <td>3</td> </tr> <tr> <td>2</td> <td>29</td> </tr> <tr> <td>3</td> <td>Stop</td> </tr> <tr> <td>5</td> <td>7</td> </tr> </tbody> </table> | Input (X) | Output | 0 | Pass | 1 | 3 | 2 | 29 | 3 | Stop | 5 | 7 |
|---|---|-----------|--------|---|------|---|---|---|----|---|------|---|---|
| Input (X)   | Output  |           |        |   |      |   |   |   |    |   |      |   |   |
| 0   | Pass  |           |        |   |      |   |   |   |    |   |      |   |   |
| 1   | 3   |           |        |   |      |   |   |   |    |   |      |   |   |
| 2   | 29  |           |        |   |      |   |   |   |    |   |      |   |   |
| 3   | Stop  |           |        |   |      |   |   |   |    |   |      |   |   |
| 5   | 7   |           |        |   |      |   |   |   |    |   |      |   |   |

**b) [10 pts] Find the value of each expression shown below.**

```

double a = 1.0, b = 2.4, c;
int i = 2, j = 3, k = 1, m;

```

|   | Expression | Value    |
|---|------------|----------|
| 1 | k+=i-1     | 2        |
| 2 | m=i/j      | 0        |
| 3 | j*=i-k     | 3        |
| 4 | i*j%5      | 1        |
| 5 | k=k+i++    | 3        |
| 6 | j>i>k      | False(0) |

|    |                                   |                 |
|----|-----------------------------------|-----------------|
| 7  | $i > j \    \ j \geq k$           | <b>True (1)</b> |
| 8  | $m = 2 * b / -a$                  | <b>-4</b>       |
| 9  | $c = ++k$                         | <b>2.0</b>      |
| 10 | $c = (2 * a) * (6 \% 10 - b / 2)$ | <b>9.6</b>      |