National University of Computer & Emerging Sci

CS 101 Introduction to Computing (ITC)

BS CS Fall 2016

Midterm Examination # 2

(PART – II)

Se ; F G H [✓ I] (circle your section)

Ma

Date: 1st Novemb

Time Allowed 30 Min

Stude

Instructions (Read them carefully):

1. Attempt all questions and all parts in order. No partial marking is allowed in any questions.
2. Avoid the use of continuation sheets. This paper is solvable on the Midterm answer sheet.
3. Do not write extra code.
4. I can mark it, if I can read it.
5. Return this question paper along with your midterm answer sheet.

1. Write a main() function for the flowchart in Figure 1.

   The description shown in the flowchart is not language specific and you have to convert it into C language specific syntax and usage. [2]

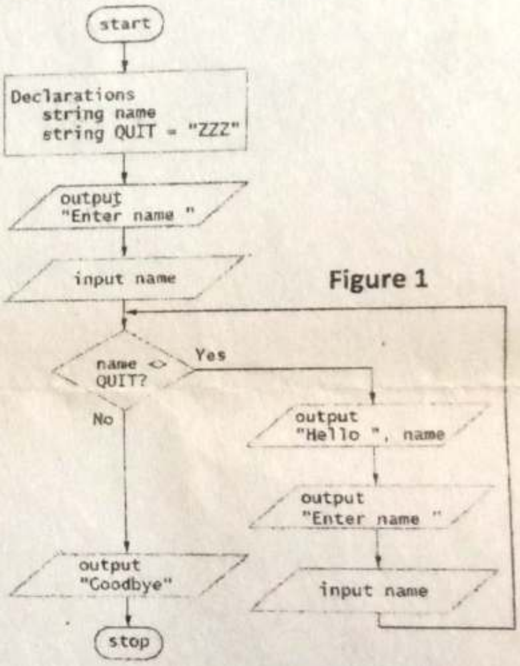

Figure 1

2. Write a C language program to find out sum of the following series:

   $F(x) = x^0/0! + x^1/1! + x^2/2! + x^3/3! + ... + x^{10}/10!$

   Your main() function reads the value of x and displays the value of the function. The second function calculates the factorial in an iterative way.

   Hint: $n! = n \times (n-1) \times (n-2) \times (n-3) \times$ .... $\times 1$, and $0! = 1$.
   Also x^n = pow(x,n) define in math.h [3]

3. Write a C language program to fill arrays "Odd", "Even" and "Fraction" by processing data stored in the "Original" array as shown below. The even and odd numbers from the Original array should be extracted and saved in even and odd arrays respectively. You need to pass even and odd arrays as parameters to a function called **fract,** which divides elements from odd array by elements from the even array (as shown) for each index. Use the following values, in each array show what your program need to store in each array. [3]

Original array is:	7,9,4,6,5,3,2,10,18 (initialized it your program without any input)
Odd array is:	7,9,5,3 (insert odd numbers in this array)
Even array is:	4,6,2,10,18 (insert even numbers in this array)
Fraction array is:	7/4, 9/6, 5/2, 3/10 (fractions is saved in this array)

---------- (X) ----------

Go through the following code and answer questions 1 to 10: (Assume integer is four bytes)

```
1        #include <stdio.h>
2        void something(int **b, int **a, int *c) {
              *a=*b;
              *b=c;
         }
         void main() {
              int *a, *b;
              int c=0, d; .          //address of c is 24718
                                //address of d is 24899
              a=malloc(sizeof(int)*10); //address 25487
              b=a+5;
              int i;
1             for (i=0; i<10; i++)  {
11                 *(a+i)=i*i;
12                 c=c+*(a+i);
              }
13            d=c;
14            for (i=4; i>=0; i--)
15                 printf("%d ", *(a+i));
16            something(&a, &b, a);
17            free(a);
18            free(b);
         }
```

	Value	c = c + *(a+2)
a	0	= 0 + 0
a+1	1	= 0 + 1 = 1
a+2	4	= 1 + 4 = 5
a+3	9	= 5 + 9 = 14
a+4	= 16	= 14+16
⋮		= 14+16+25
a+9 =	81	= 14+16+25+36
		= 14+16+25+36+49
		= 14+16+25+36+49+64
		= 14+16+25+36+49+64+81

1. Value of **a** in line 7?

0 = Just memory is allocated, here value is not assigned yet.

2. Value of **b** in line 8?

1 = 25507 as b = a+5 = 25487 + (5 * 4) ⇒ 25507
as integer is of 4 bytes

3. Value of **c** after the loop in line 10 to 12?

0 ⇒ c = 127+49+64+81 = 321

4. Value of **d** in line 13?

0 ⇒ d = 321 [as d = c]

5. Value at address **a+2** before function call in line 16?

1 = 4

6. Value at address **a+4** after loop of line 10 – 12?

1 = 16

7. Value at address **b+1** at line 13?

0 = 25507+4 ⇒ 25511 (∵ as int is of 4 bytes and b was of 25507)

8. Value of **b** after function call in line 16?

1 = value of b after function is call is same as of a

9. Value at address **a** after function call in line 16?

0 = value at address a will remain same

10. Output in the loop on line 14 & 15

1 = 16 9 4 1 0

function call:

&a → **b

&b → **a

a → *c

*a = *b // in function

[∵ &b $\xrightarrow{\text{assign}}$ &a] // done in memory

*b $\xrightarrow{\text{assign}}$ *c // in function

[∵ &a $\xrightarrow{\text{assign}}$ a // done in memory]

These are done in memory.

Circle the correct answer(s):

1\.

```
int *a, c;
a=malloc(sizeof(int));
scanf("%d", a);
c=*a;
```

Which statement(s) are true?

A. a==&c [✓ B.] c==*a C. *a==*c D. a==c

1

*(a+0) = 0
*(a+1) = 1
*(a+2) = 2
*(a+3) = 3
*(a+9) = 9

2\.

```
int *a, i;
a=malloc(sizeof(int)*10);
for (i=0; i<10; i++)
      *(a+i)=i;
```

Which of the following are valid statements? (valid assignments OR comparison are true)

A. *a==*(a+0) B. *a=a+10 [✓ C.] *(a+10)==10 D. a=a+10

0

3\.

```
int *a, *b, d, e, f;
d=5;
e=d;
f=d+e;
a=&d;
b=&f;
*b=*b+1;
d=d-*b;
```

e = 5
f = 5+5 = 10
a = address d = 5
b = address f = 10
*b = 10+1 = 11
d = 5 - 11
 = -6

Which set of statements are true/valid?

0

A	B	[✓ C]
a==&d	*a==d	~~d==e~~ d==e
*b!=f	*b==f	~~b==f~~ b=&f
e==d	e!=d	d==*a

Ans 10):

i--	i = 4	i >= 0 4 >= 0 (T)
i--	i = 3	3 >= 0 (T)
i--	i = 2	2 >= 0 (T)
i--	i = 1	1 >= 0 (T)
i--	i = 0	0 >= 0 (T)
i--	i = -1	-1 >= 0 (F)

output = *(a+i)
= *(a+4)
16
9 = *(a+3)
*(a+2) = 4
*(a+1) = 1
*(a+0) = 0

Output Screen:
16 9 4 1 0

Q11): Sharon is traveling from city A to city B. The distance between the two cities is a variable because she would like to use the equation to use for other cities. She knows that 50% of the time she will be traveling 30 miles an hour and the remaining 50% she will be traveling 65 miles per hour. Write an equation that will calculate the time it will take to travel from one city to the next.

Q12): Evaluate the following equations, given A = False, B = True, C = False, D = True.

a. R = A AND B OR C AND D
b. R = NOT (A AND B) OR NOT (D AND C)
c. R = (A OR B) AND (D OR C)
d. R = NOT (A AND B OR C) AND (A OR B AND D)
e. R = C OR NOT (A AND D) AND (A OR B) OR NOT (A OR C)

Q13): Create a table that gives all possible answers for the following logical equations. Make clear how you set up the table.

a. R = A OR B
b. R = NOT A OR B
c. R = A AND B AND (B OR C)
d. R = NOT (A OR B) AND NOT (B OR C)
e. R = B AND NOT (A OR C) OR NOT (B AND C)

Q14): Evaluate the following for the values A = 5, B = 2, C = True, D = False. (Include the structure of the order of processing.)

a. R = A + 3 > B - 1 AND C OR D
b. R = NOT C OR D OR A - 3 <= B

Q15): Set up a logical expression for the following conditions. A company gives a bonus at the end of each fiscal year. For an employee to get a bonus, the following must be true:

a. The employee has been working at the company for more than six months with no negative reports.

b. The employee has earned more than $5,000 during the fiscal year.

Q16): Set up a logical expression for the following conditions. A retail store has this **checkcashing** policy:

a. The customer must have a driver's license.

b. When the check is for more than $50, the customer must have a **checkcashing** card on file.

National University of Computer & Emergi (Karachi Campus)

CS 101 Introduction to Computin

BS CS Fall 2016

Midterm Examination # 1

Section: A B C H [✓ I] (circle your section) Max. Points: 50

ptember, 2016

Student ID: 170 Minutes

Instructions (re fully):

1. All questions c ual marks. Attempt all questions and all parts in order.
2. Attempt each question on the corresponding page. Q1 goes on Page 1, Q2 goes on
3. Use page # 7 onwards for rough work. Dry run, if required, should be done along w
4. Algorithm and Pseudocode, strictly in this paper, mean the same thing and you llow the method of your respective instructor explained during lectures.
5. Draw flowcharts and perform a dry run only if the question ask you. Otherwise write
6. Dry-runs should skip all but first three and last three loop iterations.
7. Move to next question if you don't understand it within 2 minutes. You can always reatt
8. Avoid the use of continuation sheets. This paper is solvable on the Midterm answer sheet
9. I can mark it, if I can read it.
10. Return this question paper along with your midterm answer sheet.

I have read and understood all the above instru

Student's signature ____

COMPULSORY QUESTIONS

1. Write expression for the following word problems (use all possible operators including Boolean operators from chapter # 2 of the textbook):
   a. Schools are given snow days in specific circumstances. If there is ice on the roads, but no salt*, then a snow day is given. If there is salt however, then a snow day is not given. Regardless of whether or not there is salt, whenever there is >2 inches of snow, then a snow day is given.
   b. A retail store accepts payment in the form of a check-cashing if:
      i) The customers shows a valid driving license.
      ii) The check should be drawn from the customer's bank account
      iii) When the check is for more than Rs. 1000, the customer must have a loyalty card.
   c. Three sensors are attached to a printing device, with three alarms attached to the sensors. An alarm sounds if any 2 or more of the following occur:
      i) The first sensor, "A," detects if the device needs ink.
      ii) The second sensor, "B," detects if the device needs repair.
      iii) The third sensor, "C," detects if the device should jam.
   d. A computer chip controls whether or not children are allowed to watch a specific TV show. If the time is before 5 pm, then the TV will always works. However, if it's after 5 pm, then the shows rating is used. If the rating is for General Audiences, then the TV will work; however, if the rating is for Mature Audiences, then . the TV does not turn on.

✓2. The head of the CS department would like to know a) the youngest, b) the oldest, and c) the average age of those attending the ITC course. The number of people attending the course may vary from 450 to 480 and need to be input before calculating these three ages. Develop pseudocode and flowchart for this computation. Also perform a dry run, assuming that the user has entered 18.1, 19.2, 20.0, 17.5, 19.6, and 18.2 as input.

* On a roadway, this means that if you sprinkle salt on the ice, you can melt it. The salt dissolves into the liquid water in the ice and lowers its freezing point.

⇒ Salary + Overtime =?
[illegible] [illegible] Sal.

Overtime rate (per hour)	Overtime Hours
1%	<= 2.5
1.5%	<= 4
2%	> 4

✓ 3. Develop pseudocode to calculate monthly amount due to a single employee i.e. salary plus overtime. Overtime amount is calculated based on hourly rate, shown as a percentage of the salary. The user enters monthly salary first and later overtime hours for each day of the month. The program should print the total monthly amount due to the employee.

✓ Which two numbers are equal? a) 2015 b) 011111011101 c) 07DD. Apply number conversions as part of your solution.

✓ 5. Write a pseudocode for a guessing program, which allows six tries to a user for guessing a randomly generated number (initialize 68 as your guess_num variable without using random function). At each wrong try, the program informs the user if the inputted number is either larger or smaller than guess_num. The program prints "Congrats! You won." if the user guessed correctly.

(Read below this line after completing all compulsory questions)

BONUS QUESTIONS

Note: Attempt ONLY one, if you have completed all the compulsory questions.

I. The format of a landline telephone number is +MM (NNN) OOOO-PPPP. Here MM is the two digit country code, NNN is the three digit city code, OOOO is the four digit telephone exchange code, and PPPP is the four digit subscriber code. The (+) prefix is mandatory. Write pseudocode that takes the following input:

Country Code: 92
City Code: 021
Telephone Exchange Code: 3410
Subscriber ID: 0543

and prints an international number (i.e. +92 (021) 3410-0543 for above values).

II. Write an algorithm for generating numbers in the Fibonacci series till either you have printed the given N numbers or the last number goes beyond given MAX, whichever comes first. *Hint: Fibonacci number are 0, 1, 1, 2, 3, 5, 8, 13, 21,...*

III. A top secret message needs to be transmitted and the sender decides to exchange each alphabet of the message (all of them shown in row I) with the corresponding alphabet from row II. Write pseudo-code to display the message "the quick brown fox jumps over the lasy dog" after coding. Perform a dry run using string "fox" only.

I	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
II	p	s	w	u	r	y	q	x	v	o	e	t	d	f	i	z	n	g	l	b	m	h	a	j	c	k

Hint: The user types the full message at the input prompt. However, you need to process and display the message character by character. You should not store the output message in any variable. By the way, we don't know about Arrays as yet.

---------- (X) ----------

ational University of Computer & Emerging Sciences (Karachi Campus)

CS 101 Introduction to Computing (ITC)

BS CS Fall 2016

Midterm Examination # 2

(PART – II)

Max. Marks: 8
Date: 1st November, 2016
Time Allowed 30 Minutes

Sectio **H I** (circle your section)

Student ID: 16

Instructions (Read th

1. Attempt all questions and a ts in order. No partial marking is allowed in any questions.
2. Avoid the use of continuation sheets. This paper is solvable on the Midterm answer sheet.
3. Do not write extra code.
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1. Write a main() function for the flowchart in Figure 1.

   The description shown in the flowchart is not language specific and you have to convert it into C language specific syntax and usage. [2]

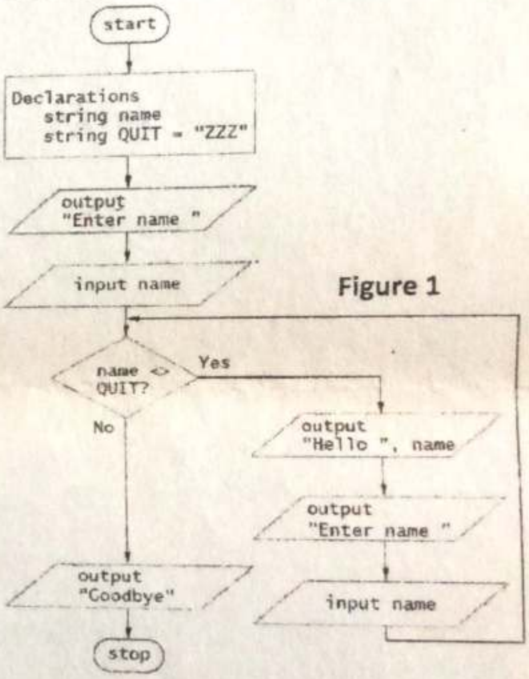

Figure 1

2. Write a C language program to find out sum of the following series:

   $\mathbf{F(x) = x^0/0! + x^1/1! + x^2/2! + x^3/3! + \ldots.. + x^{10}/10!}$

   Your main() function reads the value of x and displays the value of the function. The second function calculates the factorial in an iterative way.

   Hint: n! = n x (n-1) x (n-2) x (n-3)x .... x 1, and 0! = 1.
   Also x^n = pow(x,n) define in math.h [3]

3. Write a C language program to fill arrays "Odd", "Even" and "Fraction" by processing data stored in the "Original" array as shown below. The even and odd numbers from the Original array should be extracted and saved in even and odd arrays respectively. You need to pass even and odd arrays as parameters to a function called **fract,** which divides elements from odd array by elements from the even array (as shown) for each index. Use the following values, in each array show what your program need to store in each array. [3]

   Original array is: 7,9,4,6,5,3,2,10,18 (initialized it your program without any input)
   Odd array is: 7,9,5,3 (insert odd numbers in this array)
   Even array is: 4,6,2,10,18 (insert even numbers in this array)
   Fraction array is: 7/4, 9/6, 5/2, 3/10 (fractions is saved in this array)

---------- (X) ----------

✓ 1. What is the type of a function that does not return any value?

[✓ A) void]
B) int
C) float
D) no type

2. What is the output of the following code?

```
        int a=4;
        b=a++;
        printf("%d %d", a, b);
```

b=4 , a=5

[✓ A) 4 4]
B) 4 5
C) 5 5
[✓ D) 5 4]

8

3. What is the output of the following code?

```
        int a=4;
        int b;     1+a
        b=++a;
        printf("%d %d", a, b);
```

a=4

b=5

A) 4 4
[✓ B) 4 5]
[✓ C) 5 5]
D) 5 4

4. Identify the error (if any): Assume arrays have been initialized to Some values

```
int a[10], b[10];
int c[10], i;
for (i=0;i<10;i++) {
    if a[i] > b[i]
        c[i+1]=a[i];
    else
        c[i-1]=b[i];   was invalid
}
```

[✓ A) 'If' condition is Incorrect]
B) 'For' loop condition is incorrect
[✓ C) One of the assignments is invalid]
D) No error

✓ 5. The principal of code reuse states that every function in your program must be used more than once.

A) True
[✓ B) False]

✓ 6. Each function is executed in the order in which it is defined in the source file.

[✓ A) True]
[✓ B) False]

7. What value is assigned to x by the following statement, assuming x is 10.0?

```
        x = x - 20.0
```

A) 10
[✓ B) 10.0]
C) -10
[✓ D) -10.0]

8. While compiling a program what type of errors are shown
[✓ A) syntax errors]
B) run-time errors
C) logical errors
[✓ D) syntax and run-time errors]

G

Answer question 9-12 as follows: Evaluate the expressions if `a` is `5`, `b` is `10`, `c` is `15`, and `flag` is `1`.

9. `(c == a + b) || (!flag)`
[✓ A) True]
B) False

10. `(a != 7) && flag || (c >= 6)`
[✓ A) True]
B) False

11. `!(b <= 12) && (a % 2 == 0)`
A) True
[✓ B) False]

12. `!((a > 5) || (c < a+b))`
[✓ A) True]
B) False

13. What is the output of this program fragment?

```
int someFunction(int *a, int i) {
      int n;
      n = *(a + i) / 2;
      int f=2;
      int p=0;
      while ((f < n) && (!p)) {
            if (! (*(a+i) % f))
                  p=1;
      }
      return p;
}
int main() {
      int myArray[]={20, 25, 29, 14, 15, 33, 37, 49};
      for (i=0;i<4; i++)
            printf("%d ", someFunction(myArray, i));
      return 0;
}
```

A) 0 1 0 1 0 1 0 1
B) 1 0 1 0 0 1 0 1
C) 0 0 1 0 0 0 1 0
D) 1 1 0 1 1 1 0 1

E

14. What is the output of this program fragment?

```
int myFunction(int a[4][4]) {
      int b=1, i=0;
      while ((i<4) && (b)) {
            if (a[i][i] != 1)
```

0	1	0	0	2
1	0	1	0	3
2	0	0	1	4
3	1	0	0	1

```
            b=0;
        }
        return b;
    }

    void main() {
        int a[][]={{1, 0, 0, 2},{0, 1, 0, 3},{0, 0, 1, 4},{1, 0, 0, 1}}
        int b= myFunction(a)
        printf("%d", b);
    }
```

A) 1

[✓ B) 0]

C) Some number other than 0 or 1

D) Garbage value

15. Point out the error, if any in the *for* loop. If case of no error, do a dry run.

```
#include<stdio.h>
int main()
{
    int i=1;
    for(i=0;i<5;i++){
        printf("%d\n", i);
        if(i>3) {
                i++;
        }
    }
    return 0;
}
```

A) < operator should be replace by <=

B) For loop should be replaced by while loop

C) Variable is initialized twice.

[✓ D) No error]

16. Which of the following return-type cannot be used for a function in C?

A) char *

B) struct

C) void

[✓ D) None of the mentioned]

17. Which properly declares a variable of `struct foo`?

A) struct foo;

[✓ B) struct foo var;]

C) foo var;

D) int foo;

18. What is the output of the following program?

```
#include <stdio.h>
struct myStruct {
    int a;
} s;

void func(struct myStruct s)
{
    s.a = 10;
    printf("%d ", s.a);
}

void main()
{
    func(s);
    printf("%d\n", s.a);
}
```

[✓ A) 10 (Garbage Value)]
B) 10 10
C) 10 0
D) (Garbage Value) 10

19. which of the following will make the speed equal to 200?

```
struct car
{
int speed;
car type[10];
} vehicle;

void main() {
     struct car *ptr;
     ptr = &vehicle;
}
```

[✓ A) (*ptr).speed = 200.]
B) (*ptr) ->speed = 200
C) *ptr.speed = 200
D) &ptr.speed = 200

~~*(ptr~~) . speed
*(ptr+1) . speed
ptr .

20. What is the output of the following program?

```
#include <stdio.h>
struct s1 { int i ;};
struct s2 { int i ;};

main()
{
     struct s1 st1;
     struct s2 st2;
     st1.i = 5;
     st2 = st1;
     printf(" %d", st2.i);
}
```

[✓ A) 5]
B) Garbage Value
[✓ C) Syntax error]
D) None

⇒ we can assign a struct directly to another struct.

National University of Computer & Emerging Scienc
CS 101 Introduction to Computin
BS CS

Answer question 20– 25 given the following program segment (consider integer be of two bytes)

```
int myFunction(int *a, int *b) {
      b=a;
}

void main() {
      int *a, *b, c=0;
      a=malloc(sizeof(int)*10); //address allocated is 232471
      int i;

      for (i=0; i<10; i++) {
            if (i<=1)
                  *(a+i)=1;
            else
                  *(a+i) = *(a+i-1) + *(a+i-2)
            c=c+*(a+i);
      }
      printf("%d\n", c);
   C= myFunction(a, b);
      printf("%d\n", *b);

      free(a)
}
```

(i=0 ; i<10 ; i++)
if (0<=1)
*(a+0) = 1

(1<=1)
*(a+1) = 1

c = 0+1
= 1

c = 2

c = 2+2
= 4

*(a+2) = *(a+1) + *(a+0)
*(a+2) = 2

*(a+3) = *(a+2) + *(a+1)
= 2 + 1
*(a+3) = 3
a+4 = 3 + 2 = 5
5 + 3 = 8
5 = 5 = 8 + 5 = 13
6 = 8 + 5
7 = 13 + 8 = 2
8 = 21 + 13 = 3
9 = 21 + 34 = 5

C = 43

21. What is value of *a?
   A) 232471
   [✓ B) 1]
   C) 232472
   D) 0

22. What is the output of the first printf statement?
   A) 142
   [✓ B) 143]
   C) 144
   D) 145
   E) 43

23. What is the output of the second printf statement?
   A) Garbage value
   [✓ B) 1]
   C) NULL
   D) 232471
   E)

24. What is the value stored at address a+6 after the for loop?
   A) 232471
   B) 8
   [✓ C) 13]
   D) 232495

25. What is the value of a+i after for loop statement?
   A) 232475
   B) 232471
   [✓ C) 1]
   D) Garbage value