1. Multiple Choice Questions

1. If a float number is stored in one byte such that the first bit is the sign, the next three bit represent the exponent in excess-3 notation, and the last four bits represent the mantissa, then the bit pattern 00100100 represents (in decimal)

   a. 0.75
   b. 0.675
   c. 0.325
   d. 0.125
   e. None of the above

2. What is the size of the following declarations (alignment at multiple of 4):

```
struct vehicle {
        long carId;
        short wheels:3;
        short fuelTank : 6;
        short weight;
}
```

a) 6 b) 8 c)10 d) 12

3. Variable x is declared as follows

```
struct vehicle {
        long carId;
        short wheels:3;
        short fuelTank : 6;
        short weight;
} x[5][5];
```

if the address of x is 0xaaa and memory is aligned at multiples of 4 then what is the address of x[1]

a) 0xD2 b) 0xEA c)0xDC d) 0xAB

4. What is the output of the following program?

```
int f(int x, int *y) {
   x += 2;  *y += 1;
   return x + *y;
    }
int g(int *x, int y) {
   y = ++*x;
   return *x + y;
    }
int main( ) {
   int x = 2, y = 3;
   printf("%d   ",f(x, &y));
   printf("%d   ",g(&x, y));
```

```
    printf("%d   %d \n",x, y);
       return 0;
}
```

(A) 8 6 3 4 (B) 8 10 4 4 (C) 8 6 3 3 (D) 8 10 3 4

5. (5 pts) Which of the following two functions (printStarsA and printStarsB) can produce the following output when each is called with numStars==5 (namely printStarsA(5) and printStarsB(5):

*****
***
*

```
void printStarsA(int numStars)
{
   int i=0;

   for (i = numStars ; i >= 0; i--) {
         if (i %2 == 0) {
               int j;
               for (j = 0; j < i+1; j++) {
                     printf("*");
               }
               printf("\n");
         }
   }
}
```

```
void printStarsB(int numStars)
{
   int i = 0;
   i = (numStars % 2 == 1) ? numStars : numStars + 1;
   while (i >= 1) {
         int j;
         for (j = 0; j < i; j++) printf("*");
         printf("\n");
         i-=2;
   }
}
```

(A) printStarsA(5) and printStarsB(5)
(B) printStarsA(5) but not printStarsB(5)
(C) printStarsB(5) but not printStarsA(5)
(D) neither function

6. The program printMain prints the following "This is a test!!". Given the following code, how many times will the sentence "This is a test!!" is printed?

#include "stdio.h"
#include "uinstd.h"

```
int main()
{
    int cpid = 0;
    char *args[2]={“printMain”, NULL};

    cpid = fork();
    execv(“printMain”,cpid = fork();
    cpid = fork();
    execv(“printMain”,cpid = fork();
    sleep(10);
    return(0);
}
```

a. 1
b. 2
c. 3
d. 4
e. none of the above

7. Given two strings “first string” and “second string”.
   7.1. How much storage should be declared for each of the strings?
   7.2. What would the function strlen(“today is Wednesday”); return?

8. Given a byte in 2’s complement What is 0x56 in decimal?
   a) -13
   b) –110
   c) 38
   d) none of the above

9. if x = 0x36 then which of the following statements is incorrect
   a) if y = 0x42 then x | y is 0x76
   b) if y = 0x12 then x & y is 0x2
   c) if y = 0x42 then x & y is 0x2
   d) if y = 0x41 then x & y is 0x0
   e) All statement are correct

10. if x = 0x25 then which of the following statements is correct
    a) if y = x | (1<<1) then y is 0x26
    b) if y = x << 1 then y is 0x4A
    c) if y = x & 0x37 then y is 0x35
    d) if y = x | 0x37 then y is 0x35
    e) All of the above statements are incorrect

11. What will be the output of the following code segment?

```
int u = 21;
int v = 10;
if (u && v) printf(“ Time to move on!! ”);
if (u & v) printf(“Do it today!! \n”);
```

a. Time to move on!!
b. Do it today!!
c. Time to move on!! Do it today!!
d. None of the above

12. Given the following declaration
    char x = -12;
    char y = 63;
    if the computer uses 2's complement to represent the numbers then which statement is correct:
    a. The number of bits in x is equal to the number of bits in y
    b. The number of bits in x is less than the number of bits in y
    c. The number of bits in x is greater than the number of bits in y
    d. None of the above

13. What will be the output of the following code

```
int x = 5;
int y = 2;

f(x,y);

printf("%s \n", (x/y > 2) ?  "x is more than two times larger than y" : "x is less than or equal to 2*y\n ");

f(int x, int y)
{
  x = 2*y;

  printf("%s \n", (x/y > 2) ?  "x is more than two times larger than y" : "x is less than or equal to 2*y \n");
}
```

a. x is less than or equal to 2*y
   x is less than or equal to 2*y

b. x is less than or equal to 2*y
   x is more than two times larger than y

c. x is more than two times larger than y
   x is less than or equal to 2*y

d.x is more than two times larger than y
   x is more than two times larger than y

14. If a float number is stored in one byte such that the first bit is the sign, the next three bit represent the exponent in excess-3 notation, and the last four bits represent the mantissa, then if the number is 3.25 then what is the bit pattern

a. 00111101
b. 01011101
c. 00110110
d. 01011110
e. None of the above

15. A float number is stored in one byte where the first bit is the sign, the next three bit represent the exponent in excess-3 notation, and the last four bits represent the mantissa. Which bit pattern stores the number 3.25

a. 01001010
b. 00111101
c. 01001100
d. 00111010
e. None of the above

16. A float number is stored in one byte where the first bit is the sign, the next three bit represent the exponent in excess-3 notation, and the last four bits represent the mantissa. Which bit pattern stores the number 3.25

17. You coded a set of statistcs functions in a file called stats.c. The header file stats.h contains the prototypes of the functions.

Which of the following commands will produce an object file

a. gcc stats.c
b. gcc –c stats.c
c. gcc –g stats.c
d. gcc –o stats.c
e. gcc –o stats.c stats.h

18. A float number is stored in one byte where the first bit is the sign, the next three bit represent the exponent in excess-3 notation, and the last four bits represent the mantissa. Which bit pattern stores the number 3.25

19. What will be the output of the following code?

```
#include<stdio.h>
int main()
{
    int i;
    int k = 10;

    for(i=0; i<4; i++){
        int k=3;
        int i = 1;
        printf(" %d, ",k*i);
```

```
            k += i;
            i+=4;
        }
        return 0;
    }
```

a) 3,
b) 3, 4, 5, 6,
c) 0, 3, 6, 9,
d) 3, 3, 3, 3,
e) None of the above or code may not compile

20. What will be the output of the following code

```
#define mul(x,y) (x * y)

int main()
{
   int x = 3;
   int y = 4;
   int z = 0;

   z = mul(x+1, y+1);

   printf("4*5 = %d \n", z);
}
```

a) 8
b) 10
c) 12
d) 20
e) none of the above

21. Which of the following function declaration is correct

```
#include<stdio.h>

int main()
{
    int arr[5][6];
    avg(arr);
    return 0;
}
```

a) `void avg(int *a[5][6])`
`{`
`}`
	b) `void avg(int a[][6])`
	`{`
	`}`

c) `void avg(int *a[][6])`
`{`
`}`
	d) `void fun(int a[][4])`
	`{`
	`}`

22. A binary file stores a list of company's salaries. Each salary is stored as float. Which code fragment below will read the third salary of the file into a variable *sal*. The file is already opened using the file description *fid*.

a. fseek(fid, 0, SEEK_SET);
fread(&sal, sizeof(double), 1, fid);

b. fseek(fid, 0, SEEK_END);
rc = ftell(fid);
fseek(fid, rc - 3*sizeof(double), SEEK_END);
fread(&sal, sizeof(double), 1, fid);

c. fseek(fid, 0, SEEK_SET);
rc = ftell(fid);
fseek(fid, rc - 2*sizeof(double), SEEK_CUR);
fread(&sal, sizeof(double), 1, fid);

d. fseek(fid, 0, SEEK_SET);
fseek(fid, 2*sizeof(double), SEEK_CUR);
fread(&sal, sizeof(double), 1, fid);

e. None of the above

23. What will be the output of the following code

```
#include<stdio.h>
int main()
{
    char *p;
    p="%d\n";
    p++;
    p++;
    printf(p-2, 100);
    return 0;
}
```

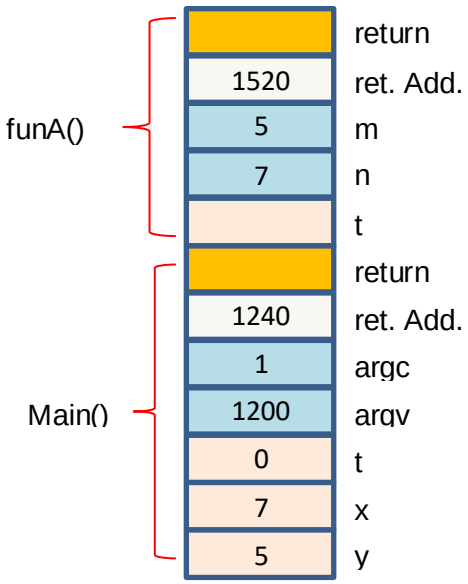
a. 100
b. 00
c. 10
d. compiler error
e. none of the above

24. Given the following code and a snapshot of the frame stack. Which line of code is most likely being currently executed? Namely, which counter does the program counter points to?

Code

```
1  int funA(int m, int n)
2  {
3     int t;
4     t = 5*m + n;
5     return(t);
6  }
7
8  int main(int argc, char **argv)
9  {
10   int t=0;
11   int x=5, y=7;
12   t = funA(x, y);
13   printf("funA(%d, %d) = %d \n",x,y,t);
14   return(0);
25 }
```

Frame Stack



Options

a) 12 **b)** 13 **c)** 4 **d)** 6 **e)** None of the above

25. What will be the output of the following code

```
#define TRIPPLE(x)  (3*x)

int x = 4;
printf("triple(%d) = %d \n",x+1, TRIPPLE(x+1));
```

a. triple(5) = 12
b. triple(5) = 13
c. triple(4) = 14
d. triple(4) = 15
e. none of the above

26. How many processes will be created by executing the following code:

```
int main()
{
    int cpid = 0;
```

```
    cpid = fork();
    cpid = fork();
    cpid = fork();
    sleep(10);
    return(0);
}
```

a. 3
b. 5
c. 6
d. 8
e. none of the above

27. You coded a program that consists of several files:
    1. employee.c – containing the code to load employee records from a database and produce statistical information about the employees. The file contains main().
    2. employee.h – contains the declaration of the employee structure and function prototypes
    3. stats.c – file contains code to which computes statistical functions (e.g., average and standard deviation)
    4. stats.h – file contains the function prototypes of (declaration) of the stats functions

    Which of the make files will correctly generate an executable program with the name employee?

a)	**b)**

employee: stats.o employee.o
  gcc –o employee stats.o employee.o
 	
employee.o: employee.h
  gcc -c employee.c
 	
stats.o: stats.h
  gcc -c stats.c
	stats.o: stats.h stats.c
	  gcc –c stats.c
	
	employee.o: employee.h employee.c
	  gcc –c emplyee.c
	
	employee: employee.o stats.o
	  gcc –o employee employee.o stats.o

c)	d)

employee: main.o stats.o employee.o
  gcc –o employee stats.o employee.o
 	
employee.o: employee.h
  gcc employee.c
 	
stats.o: stats.h
  gcc stats.c
	employee: stats.o employee.o
	  gcc –o employee stats.o employee.o
	
	employee.o: employee.h
	  gcc -c employee.c
	
	stats.o: stats.h
	  gcc stats.c

2. Programming Questions

1. Write a function, that its input is a long integer and a bit number in a char, and returns a 1 if the bit at location bit number is set to 1

2. Write a function that gets two integers as input and swaps the two integers

3. Write a function, that its input is a long integer and a bit number in a char, and returns a 1 and sets the bit at location bit number 1 leaving all other bits unchanged.

4. Write a function that checks whether a file exists. The function should return 1 if the file exists and 0 if the file does not exist. The function should accept as input the file name as a pointer to a char.

   4.1. What is the function prototype?
   4.2. What is the function code?

5. Write a function that accepts a handle to a binary file and prints the third last record in the file. The records in the binary file are salaries of employees in a company. Each record is a double (namely each salary is stored as a double). The function prototype is

   void printThirdLast(FILE *fid);