GATE Computer Science Engineering Coaching by IGC
Data Structures & Programming Assignment - 1

Q1. What does the following code do?

```
Var a, b : integer;
begin
   a:=a+b;
   b:=a-b;
   a:=a-b;
end;
```

  a) exchanges (a) and (b)
  b) doubles (a) and stores in (b)
  c) doubles (b) and stores in (a)
  d) leaves (a) and (b) unchanged

Q2. Faster access to non-local variables is achieved using an array of pointers to activation records called a

  a) stack
  b) heap
  c) display
  d) activation tree

Q3. Consider the following C function definition

```
int Trial(int a, int b, int c)
{
   if ((a >= b) && (c < b)) return b;
   else if (a >= b) return Trial (a,c,b);
   else return Trial (b,a,c);
}
```

The function Trial :

  a) Finds the maximum of a, b and c.
  b) Finds the minimum of a, b and c.
  c) Finds the middle number of a, b and c
  d) None of these.

Q4. The following C declarations

```
struct node{
    int i;
    float j;
};

struct node *s[10];
```

define s to be

   a) An array, each element of which is a pointer to a structure of type node.
   b) A structure of 2 fields, each field being a pointer to an array of 10 elements.
   c) A structure of 3 fields, an integer, a float, and an array of 10 elements.
   d) An array, each element of which is a structure of type node.

Q5. The most appropriate matching for the following pairs

List I	List II
X. m = malloc(5); m = NULL;	1. using dangling pointers
Y. free(n); n→ value = 5;	2. using uninitialized pointers
Z. char *p; *p='a';	3. lost memory

   a) X-1, Y-3, Z-2
   b) X-2 ,Y-1 ,Z-3
   c) X-3 ,Y-2 ,Z-1
   d) X-3 ,Y-1 ,Z-2

Q6. Consider the following C declaration

```
struct {
    short s[5]
    union {
        float y;
        long z;
    } u;
} t;
```

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Assume that objects of the type short, float and long occupy 2 bytes, 4 bytes and 8 bytes respectively. The memory requirement for variable t, ignoring alignment considerations, is

a) 22 bytes
b) 14 bytes
c) 18 bytes
d) 10 bytes

Q7. Consider the following three C functions :

```
[P1]    int *g (void)
        {
            int x = 10;
            return (&x);
        }
[P2]    int *px;
        {
            int *px;
            *px = 10;
            return px;
        }
[P3]    int *g (void)
        {
            int *px;
            px = (int *)malloc(sizeof(int));
            *px = 10;
            return px;
        }
```

Which of the above three functions are likely to cause problems with pointers ?

a) Only P3
b) Only P1 and P3
c) Only P1 and P2
d) P1, P2 and P3

Q8. The value of j at the end of the execution of the following C program

```
int incr (int i)
{
    static int count = 0;
```

```
    count = count + 1;
    return(count);
}

main () {
    int i, j;
    for (i = 0; i <= 4; i++)
        j = incr(i);
}
```

is

    a) 10
    b) 4
    c) 6
    d) 7

Q9. What is printed by the print statements in the program P1 assuming call by reference parameter passing ?

```
Program P1()
{
    x = 10;
    y = 3;
    func1(y,x,x);
    print x;
    print y;
}
func1(x,y,z)
{
    y = y + 4;
    z = x + y + z;
}
```

    a) 10, 3
    b) 31, 3
    c) 27, 7
    d) None of these

Q10. Consider the following program

    Program P2

```
var n:int;
procedure W(var x:int)
begin
    x = x + 1;
    print x;
end
procedure D
begin
    var n:int;
    n = 3;
    W(n);
end
begin \\ begin P2
    n = 10;
    D
end
```

If the language has dynamic scoping and parameters are passed by reference, what will be printed by the program ?

a) 10
b) 11
c) 3
d) None of these.

Q11. Consider the following declaration of a two-dimensional array in C
    char a[100][100];
Assuming that the main memory is byte addressable and that the array is stored starting from memory address 0, the address of a[40][50] is

a) 4040
b) 4050
c) 5040
d) 5050

Q12. Assume the following C variable declaration.
    int *A[10], B[10][10];
Of the following expressions
1. A[2]
2. A[2][3]
3. B[1]
4. B[2][3]

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Which will not give compile time errors if used as left hand side of assignment statement in a C program ?

a) 1, 2 and 4 only
b) 2, 3 and 4 only
c) 2 and 4 only
d) 4 only

Q13. Consider the C program shown below.

```c
#include <stdio.h>
#define print(x) printf("%d", x)
int x;
void Q(int z) {
    z += x;
    print(z);
}
main(void) {
    x = 5;
    p(&x);
    print(x);
}
```

The output of this program is

a) 12 7 6
b) 22 12 11
c) 14 6 6
d) 7 6 6

Q14. Consider the following C function

```c
void swap(int a, int b)
{
    int temp;
    temp = a;
    a = b;
    b = temp;
}
```

In order to exchange the values of two variables x and y.

a) call swap(x,y)
b) call swap(&x,&y)

c) swap(x,y) cannot be used as it does not return any value.
d) swap(x,y) cannot be used as the parameters are passed by value.

Q15. Consider the following C function

```
int f(int n)
{
    static int i = 1;
    if(n >= 5) return n;
    n = n + i;
    i++;
    return f(n);
}
```

The value returned by f(1) is

a) 5
b) 6
c) 7
d) 8

Q16. Consider the following C program

```
main()
{
    int x, y, m, n;
    scanf("%d %d", &x, &y);
    /* Assume x > 0 and y > 0 */
    m = x; n = y;
    while(m!=n) {
        if(m>n)
            m = m - n;
        else
            n = n - m;
    }
    printf("%d", n);
}
```

The program computes

a) x/y , using repeated subtraction.
b) x mod y using repeated subtraction.
c) the greatest common divisor of x and y

d) the least common multiple of x and y

Q17. Consider the following program fragment for reversing the digits in a given integer to obtain a new integer. Let $n = d_1d_2d_3...d_m$.

```
int n, rev;
rev = 0;
while(n > 0) {
    rev = rev * 10 + n % 10;
    n = n / 10;
}
```

The loop invariant condition at the end of the ith iteration is

a) $n = d_1d_2d_3...d_{m-i}$ and $rev = d_md_{m-1}...d_{m-i+1}$
b) $n = d_{m-i+1}...d_{m-1}d_m$ and $rev = d_{m-i}...d_2d_1$
c) $n \ != rev$
d) $n = d_1d_2...d_m$ and $rev = d_m...d_2d_1$

Q18. Consider the following C program segment :
```
char p[20];
char *s = "string";
int length = strlen(s);
for(i = 0; i < length; i++)
    p[i] = s[length - i];
printf("%s", p);
```

The output of the program is

a) gnirts
b) string
c) gnirt
d) no output is printed

Q19. What does the following C statement declare ?
```
int (*f)(int *);
```

a) A function that takes an integer pointer as argument and returns an integer.
b) A function that takes an integer pointer as argument and returns an integer pointer.

c) A pointer to a function that takes an integer pointer as argument and returns an integer.
d) A function that takes an integer pointer as argument and returns a function pointer.

Q20. Consider the following C program :-

```c
double foo(double); /* Line 1 */
  int main() {
     double da, db;
     // input da
     db = foo(da);
  }
double foo(double a) {
   return a;
}
```

The above code is compiled without any error or warning. If Line 1 is deleted, the above code will show

a) No compile error or warning.
b) Some compiler warning not leading to unintended results.
c) Some compiler warning due to type mismatch eventually leading to unintended results.
d) Compiler errors.

Answers -

1. b
2. d
3. d
4. a

5. d
6. c
7. c
8. a
9. b
10. d
11. b
12. a
13. a
14. d
15. c
16. c
17. a
18. d
19. c
20. c