ARICENT: First Mile Foundation Program

Quiz 3 Solutions

1. **What would happen if**

```
main() {
    main();
}
```

is executed.

A. Compile time error.
B. The program will run forever and has to be manually terminated.
C. The stack would overflow and eventually the program will be killed by the operating system.
D. main() executes only once.

Answer : C

It executes until there is overflow in the call stack.

2. **In a function, what is the maximum number of return statements possible**

A. 1
B. 2
C. 4
D. None of the above

Answer : D

There is no restriction to the number of returns statements in a program.

3. **What will be the output of the following program?**

```
#include <stdio.h>
void demo();
int main()
{
   void (*fun)();
   fun = demo;
   (*fun)();
   fun();
   return 0;
}
void demo()
{
   printf("India ");
}
```

A. India
B. India India
C. India India India
D. Compiler Error

Answer : B

This is a simple program with function pointers. *fun* is assigned to point to *demo*. So the two statements *"(*fun)();"* and *"fun();"* mean the same thing.

4. Express the return value of fun2( ) in terms of a and b.

```
int fun1(int x, int y)
{
   if (x == 0)   return 0;
   return (y + fun1(x-1, y));
}

int fun2(int a, int b)
{
   if (a == 0) return 1;
   return fun1(fun2(a-1, b),b );
}
```

A. a*b
B. a+a*b
C. a^b
D. b^a

Answer : D

The function multiplies b to itself a times which is b^a.

5. What is the running time of the program?

```
void fun(int n, int arr[])
{
   int i = 0, j = 0;
   for(; i < n; ++i)
      while(j < n && arr[i] < arr[j])
         j++;
}
```

A. O(n)
B. O(n^2)
C. O(nlogn)
D. O(log n)

Answer : A

Since the variable j is not initialized for each value of variable i. So, the inner loop runs at most n times

6. Can you have a pointer that points to a function?

A. Yes
B. No

Answer : A

Yes,you can have a pointer to function in C language just like pointer to data types.

7. How many times the following loop runs for given value of n?

```
for(int i=2 ; i<=n ; i=i*4){
    printf("%d",i);
}
```

A.O(n)
B.O(log n)
C.O(n^2)
D.O(sqrt(n))
E.None of above

Answer : B

This loop iterates as follows,

i=2=2*(4^0)
i=2*4=2*(4^1)
i=(2*4)*4=2*(4^2)
…..
……..
i=2*(4^k) <= n
……
log2 + k*log 4 <= log n

k=log n
so, complexity=O(log n).

8. How many times the following loop runs for given value of n?

```
for(int i=2 ; i<=n ; i=pow(i,2)){
    printf("%d",i);
}
```

A. O(n)
B. O(log n)
C. O(n^2)
D. O(sqrt(n))
E. None of above

Answer : E

This loop iterates as follows,

i=2
i=2^2
i=(2^2)^2
……
……..
i=2^(2^k)<= n

k=log log n
so, complexity=O(log log n).

9. **Which of the following function singatures are correct for passing a two dimensional array A of 10 rows and 10 columns to a function xyz() in C? There should not be any compiler error or warning when you do so.**

A. xyz(int A[])
B. xyz(int *A[])
C. xyz(int A[][10])
D. xyz(int A[10][])

Answer : B,C

xyz(int *A[]) : Second dimension fixed
xyz(int A[][10]) :Passing by double pointe

10. **Point out the line in the following code segment which would result in a compilation error:**

```
#include<stdio.h>  //line1
void f()           //line2
{                  //line3
  printf("Hi");    //line4
}                  //line5
main()                     //line6
{                  //line7
  int a=10;        //line8
  a=f();           //line9
  printf("\n%d",a); //line10
}                  //line11
```

Answer :Line 9

The function is a void function so it cannot return any value.

11. **What does the following function do?**

```
int f(int x,int y){
    while(x!=y){
            if(x>y)
                return f(x-y,y);
            else
                return f(x,y-x);
    }
    return x;
}
```

A. Calculates Least Common Multiple (LCM)
B. Calculates Greatest Common Divisor (GCD)
C. Divides two numbers
D. Subtracts two numbers

Answer : B

This is a recursive way to calculate GCD.Euclidean algorithm

12. What is the output of the following program?

```
int i;
int fun();

int main()
{
   while(i)
   {
      fun();
      main();
   }
   printf("Hello\n");
   return 0;
}
int fun()
{
   printf("Hi");
}
```

A. Hello
B. Hi Hello
C. No output
D. Infinite loop
Answer : A

As in *int i;* the variable i is declared as global,so by default it is initialized with value 0. So,while condition will fail. Hence the output of the program is "Hello".

13. What will be the output of A(2,4) for the following recursive definition?

A(m,n)= (n+1) if(m=0)
A(m,n)= A(m-1,1) if(m>0 and n=0)
A(m,n)= A(m-1,A(m,n-1)) if(m>0 and n>0)

A. 5
B. 6
C. 9
D. 11
Answer : D

This is Ackermann function and answer of A(2,4) is 11.

14. You are given a set of n points on the number line. They are given in arbitrary order. The task is to find the points that are closest to each other.

To solve the problem you decide to take one point and compute its distance to all other points and repeat this process for all points. During the process you track the closest pair.

What is the running time of this algorithm ?
A. O(n)

B. O(n^2)
C. Runtime is independent of n.
D. O(log n)
Answer : B

Note that there are nC2 many pairs of points that the algorithm takes. This is equal to O(n^2) running time.

15. *int fact_comp(int n)*

```
{
   if (n == 1 || n == 0)
     return 1;
   else
     return n*fact(n-1);
}
```

How many times is the function fact_comp() called when we want to compute fact_comp(n) ? (Assume: n is a positive integer input)
A.. 1
B. n
C. 2n
Answer : B

The *fact_comp* function goes all the way from n to 1. Exactly n steps.

16. *#include <stdio.h>*

```
void strEdit(char *str)
{
   str[0] = 'A';
}
int main()
{
   char str[5] = "PDSA";
   strEdit(str);
   printf("%s\n",str);
   return 0;
}
```

What is the output of the program ?
A. PDSA
B. ADSA
C. Program doesn't compile.
D. AAAA
Answer : B

The character array is passed by reference. The change in the function is reflected in the program output.

17. *int fun(int n)*

```
{
    static int i = 0;
    if (n > 1){
        n = n/2;
        i = i+1;
        fun(n);
    }
    else
        return i;
}
```

What does fun(n) compute ?

A. Number of digits in n

B. Integer part of logarithm of n base 2

C. Function always returns 0

D. n/2in

Answer: B

The function computes the integer part of logarithm of n to the base 2.