Indian Institute of Information Technology Design and Manufacturing Kancheepuram
Department of Computer Science and Engineering
Ph.D Selection Test – June 2018

Duration: 2 hours   **Answer in the space provided**   **Marks: 4 * 10 = 40**

Computer Organization   **(10 Marks)**

1. State the expression of bias in IEEE 754 Format. A IEEE754 format floating point number is represented in the 8-bits, excess exponent is represented in 3-bits, what is the bias of it? (2 Marks)

2. State the procedure to add two IEEE 754 format Numbers. (2 Marks)

3. Represent Decimal Digit '0' (ZERO) into 4-bit binary representation of 2's Complement format, 1's complement format, signed Magnitude format and excess-3 format. (2 Marks)

4. Is it possible to design a computer system without cache memory? If your answer is YES Justify your answer with suitable example? If your answer is NO justify your answer is with suitable example, why cannot we do? (2 Marks)

5. Which type cache mapping scheme will be faster and efficient? Why? Justify Your answer. (2 Marks)

Discrete Mathematics   **(10 Marks)**

1. Let A = {a,b,c}.   Write the powerset of A.   (1 mark)

2. Let A={a, c, {c}}. Write the powerset of A.   (1 mark)

3. Let A={1,2,3} B={a,b}. Draw all functions.   (3 marks)

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 4. How many subsets are there on a set of size n. Prove your answer.   (3 marks)

5. (i) Give an example binary relation which is reflexive but not symmetric (ii) Give an example binary relation which is reflexive but not transitive   (2 marks)

C programming   (10 Marks)

1. The number of tokens in the following C statement.

    printf("Hello , World !\n");   is :

   (a) 5   (b) 14   (c) 10   (d) 15

2. 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 + i;

   return (count);   }

   main () {

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

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

3. 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, c   (d) None of the above

4. Consider the following C function

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

5. Which of the following is the valid default value of a Boolean type?

(a) 0   (b) 1   (c) True   (d)False

6. Which of the following is the correct way to set a value 3.14 in a variable pi such that it cannot be modified?

(a) pi = 3.14F;   (b) const float pi = 3.14F;   (c) const pi; pi = 3.14F;   (d) float pi = 3.14F;

7. Consider the following variable declarations and definitions in C

i) int var_9 = 1;   ii) int 9_var = 2;   iii) int _ = 3;

Choose the correct statement w.r.t. above variables:

(a) Both i) and iii) are valid   (b) Only i) is valid   (c) Both i) and ii) are valid   (d) All are valid

8. For a given integer, which of the following operators can be used to "set" and "reset" a particular bit respectively?

(a) | and &   (b) && and || (c) & and | (d) || and &&

9. In the context of C data types, which of the followings is correct?

(a) "unsigned long long int" is a valid data type   (b)"long long double" is a valid data type

(c) "unsigned long double" is a valid data type   (d) (a), (b) and (c) all are valid data types

10. With respect to following "for" loops in C, pick the best statement Assume that there is a prior declaration of 'i' in all cases

(i) for (i < 10; i = 0 ; i++)   (ii) for (i < 10; i++ ; i = 0) //   (iii) for (i = 0; i < 10 ; i++) //

(iv) for (i = 0; i++ ; i < 10) //   (v) for (i++; i = 0 ; i < 10) //   (vi) for (i++; i < 0 ; i = 10) //

(a) All the above "for" loops would compile successfully.

(b) All the above "for" loops would compile successfully. Except (iii), the behaviour of all the other "for" loops depend on compiler implementation.

(c) Only (iii) would compile successfully.   (d) Only (iii) and (iv) would compile successfully.

Design and Analysis of Algorithms   (10 Marks)

1. Is it that binary search algorithm is always more efficient than linear search algorithm. Justify your answer   (2 Marks)

2. Suppose an array **a** of size **n** has distinct integers from the set **{1, ..., n + 1}.** Write an algorithm to find the integer which is present in the set, but not in the array.   (2 Marks)

3. Write the worst case time complexity of quick sort as recurrence relation and solve it   (2 Marks)

4. Write the height of the essentially complete binary tree with n nodes. Justify your answer
(2 Marks)

5. Which of the following data structures will you prefer for efficient implementation of **Dictionary ADT** . Why? (2 Marks)
   - Binary Search Tree
   - AVL Tree