A. Please choose one answer for each of the following questions. 15%

1. Computers in first generation were built by using:
   (a) circuit  (b) vacuum tubes  (c) large scale integration  (d) magnetic drum  (e) card I/O
2. One of the software in first generation was:
   (a) COBOL  (b) machine language  (c) assembler  (d) JAVA  (e) C++
3. Which one is NOT an input device?
   (a) Mouse  (b) Printer  (c) Keyboard  (d) digital camera  (e) card device
4. Which one is wrong:
   (a) Byte = 8 bits  (b) 1 KB = 2^10 bytes  (c) 1 MB = 2^13 bytes  (d) 1 GB = 2^10 bytes  (e) 1 T = 2^40
5. Which component can be found on motherboard of PC?
   (a) floppy disk  (b) hard disk  (c) magnetic tape  (d) DDR-RAM  (e) CD-ROM

B. Please fill up the result into blanks. 15%

1. \(10000101_2 + 1110010010_2 = \quad \) \(s = \quad \) \(16\)
2. \(AB_{10} + 1F_{16} = ? \quad \) \(16\)
3. Binary number \(10000101_2\) its 2's complement is: \(\quad\)
4. Show the number \(-4\) of 2's complement in 8 bits: \(\quad\)

C. Explain the functions of followings: 20%

1. (a) Stacks, (b) Queue, (c) Tree and (d) Binary search tree.
2. Please give an example of computer application for each function above, respectively.
3. Generate the binary search tree for following number: 6, 4, 7, 9, 0, 3, 1, 2, 8.

D. Please choose one answer for each of the following questions. 30%

1. How many times will the following program print \texttt{hello}? (a) 10 (b) 8 (c) an infinite number of times (d) 0
   \(i = 1;\)
   while ( \(i <= 10\) )
   cout << "hello";
2. What is the final value of \(x\) after performing the following operations? (a) 8.25 (b) 5.5 (c) 5 (d) 8
   \texttt{int x = 21;}
   \texttt{double y = 6;}
   \texttt{double z = 14;}
   \texttt{y = x / z;}
   \texttt{x = 5.5 * y;}
3. In which of the following is \(y\) not equal to 5 after execution? Assume \(x\) is equal to 4. (a) \(y = 5;\) (b) \(y = x++;\)
   (c) \(y = ++x;\) (d) \(y = x = 5;\)
4. Which of the following functions does not contain any errors?
   (a) void printint (int x)
   (b) int cube( int s)
   (c) double triple( float n)
   (d) double circumference( int r);
   { cout << x; 
   int s;
   { return (3 * n); } return (3.14 * 2 * r); 
   return x; 
   return (s * s * s); }

5. What value does function mystery return when called with a value of 4? (a) 1  (b) 24  (c) 0  (d) 4
   int mystery ( int number ) {
   if ( number <= 1 )
       return 1;
   else
       return number * mystery( number - 1 );
   }

6. Given the following declaration, what is the value of b[1][0]? (a) 0  (b) 1  (c) 3  (d) this is not a valid declaration
   int b[2][2] = {{1}, {3, 4}};

7. Three of the following expressions have the same value. Which of the following’s value is different from the others?
   (a) *&Ptr  (b) *&Ptr  (c) *Ptr  (d) Ptr

8. Given that k is an integer array starting at location 2000, kPtr is a pointer to k, and each integer is stored in 4 bytes of memory, what location does kPtr + 3 point to? (a) 2003  (b) 2006  (c) 2012  (d) 2024

9. Assuming that t is an array and tPtr is a pointer to that array, what expression refers to the address of the fourth element?
   (a) *(tPtr + 3)  (b) tPtr[3]  (c) &t[3]  (d) *(t + 3)

10. Linked lists allow (a) insertions and removals anywhere (b) insertions and removals only at one end (c) insertions at the back and removals from the front (d) none of the above

E. Please write C/C++ programs to answer the following questions. 20 %

1. For the graphical representation of a stack as shown in the following, (a) define a structure stackNode that contains a self-referential structure (5 %) and (b) write the code that should appear in a function that pushes an integer to the top of the stack. (5 %) newPtr is a pointer to the new node to be added, and stackPtr is a pointer to the top of the stack. Each node contains a pointer nextPtr, a link to a node.

   ![Graphical representation of a stack](image)

2. Write a program to count the appearance frequency of each number in an array. For example, given an integer array a[5]=[3,5,6,8], your program will output the following data.

<table>
<thead>
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<th>Number Frequency</th>
<th>Number Frequency</th>
<th>Number Frequency</th>
<th>Number Frequency</th>
<th>Number Frequency</th>
<th>Number Frequency</th>
</tr>
</thead>
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<td>2</td>
<td>0</td>
<td>4</td>
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</tr>
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</tr>
<tr>
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<td>7</td>
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<tr>
<td>9</td>
<td>0</td>
<td></td>
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</tbody>
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