1. Please answer the following questions:
   (a) What shall we set the resolution of digital camera, if we want to print out a 5"X7" photo by a photo printer with 300 dpi resolution?
   (b) How many photos can be stored in a 512MB CF memory card if the picture format is raw (uncompressed and no other overhead information)?

2. Show the following numbers in 32-bit IEEE format (The exponent is 8 bits Excess_127).
   (a) $-2^{10} \times 1.10001$
   (b) $+2^{3} \times 1.111111$

3. (a) In circuit below, the rectangles represent the same type of gate. Based on the input and output information given, identity whether the gate involved is an AND, OR or XOR?

(b) Suppose you want to isolate the middle four bits of a eight-bit string by placing 0s in the other four bits without disturbing the middle three bits. What mask must you use together with what operation?


5. Describe and compare the difference of symmetric cryptosystem and asymmetric cryptosystem

6. A binary tree has eight nodes. The inorder and postorder traversal of the tree follow. Draw the tree:
   Postorder: FECHGDBA
   Inorder: FECABHGD

7. Please answer the following questions:
   (a) What is a cross-platform program?
   (b) What is Defragmenting for disk mangment?

8. Please answer the following questions:
   (a) What is meant by the software life cycle?
   (b) What is the difference between black-box testing and glass-box testing? How does open-source development differ from beta testing? Explain your answer.
(5%) 9. Describe and compare the difference of SSL and SET protocols

(5%) 10. Consider the following two relations in a relational database:

<table>
<thead>
<tr>
<th>I</th>
<th>J</th>
</tr>
</thead>
<tbody>
<tr>
<td>p</td>
<td>2</td>
</tr>
<tr>
<td>q</td>
<td>6</td>
</tr>
<tr>
<td>r</td>
<td>4</td>
</tr>
<tr>
<td>s</td>
<td>7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>K</th>
<th>L</th>
<th>M</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>a</td>
<td>u</td>
</tr>
<tr>
<td>4</td>
<td>b</td>
<td>v</td>
</tr>
<tr>
<td>2</td>
<td>c</td>
<td>w</td>
</tr>
<tr>
<td>8</td>
<td>d</td>
<td>x</td>
</tr>
</tbody>
</table>

What is the result of executing the following SQL statement?

```sql
select A.I, B.L
from A, B
where A.J > B.K
```

(10%) 11. (a) What’s the deadlock? What’s the three conditions that will cause deadlock when they happen simultaneously? Please illustrate them in detail.

(b) Suppose the following solutions have been proposed for removing the deadlock that occurs in a single-lane bridge when two cars meet. Identify which condition for deadlock given in the text is removed by each solution.

1. Don’t let a car onto the bridge until the bridge is empty
2. If cars meet, let one of them back up
3. Add a second lane to the bridge

(10%) 12. (a) What is the function of each layer of the OSI model?

(b) What is EIP (Enterprise Information Portal)? What is SCM (Supply Chain Management)?

(10%) 13. Fast_transpose algorithm for sparse matrix transpose

(a) Describe the functions of the array `row_terms` and `starting_pos`.

(b) Describe the sparse matrix, shown as right, by triple `<row,col,value>` style. Show the example according matrix. (Generate array `a[]`).

(c) Show the example for generating the `row_terms` array and `starting_pos` array

(d) Analysis the time complexity of the purpose algorithm.
Algorithm or program design (using any programming language)

(a) Write a recursive algorithm to find the combination of \( n \) objects taken \( k \) at a time using the following definition.

\[ \text{Combination (n, k), Input: 2 integers (n and k)} \]

(b) Write a program to find all prime numbers which are less than \( N \). Please analysis the performance of your program.