

1. (6%) What conditions are necessary for deadlock to occur? (4%) Describe a scenario that leads to deadlock in a computer system
2. (5%) Suppose a password consisted of *ten characters* from the English alphabet (26 characters, please be aware that there's upper and lower case difference.). If each possible password could be tested in 0.001 second. How long would it take to test all possible passwords? (Just list the equation.)
3. (10%) In what way could TCP be considered a better protocol for implementing the transport layer than UDP? In what way could UDP be considered better than TCP?
4. (7%) The following program segment is designed to compute the product of two *nonnegative integers* X and Y by accumulating the sum of X copies of Y; that is, 3 times 4 is computed by accumulating the sum of three 4s. Is the program segment correct? Explain your answer.

Product=0;

Count=0;

Repeat{

 Product=Product+1;

 Count=Count+1;

}until (Count==0)

5. (7%) Translate the following pseudo-code program into the machine language described in the table shown below. Assume X stored in the memory whose address is "D" and the program begins at the address "10".

X=0;

While ($X \leq 3$) {

 X=X+1;}

Op-code	Operand	Description
A	RXY	LOAD the register R with the bit pattern found in the memory cell whose address is XY. Example: A4A3 would cause the contents of the memory cell located at address A3 to be placed in register 4.
B	RXY	LOAD the register R with the bit pattern XY. Example: B0A3 would cause the value A3 to be placed in register 0.
C	ORS	STORE the bit pattern found in register R in the memory cell whose address is S. Example: C5B1 would cause the contents of register 5 to be placed in the memory cell whose address is B1.
D	RST	MOVE the bit pattern found in register R to register S. Example: D0A4 would cause the contents of register A to be copied into register 4.
E	RST	ADD the bit patterns in registers S and T as though they were two's complement representations and leave the result in register R. Example: E726 would cause the binary values in registers 2 and 6 to be added and the sum placed in register 7.
F	RXY	JUMP to the instruction located in the memory cell at address XY if the bit pattern in register R is equal to the bit pattern in register number 0. Otherwise, continue with the normal sequence of execution. Example: F43C would first compare the contents of register 4 with the contents of register 0. If the two were equal, the pattern 3C would be placed in the program counter so that the next instruction executed would be the one located at that memory address. Otherwise nothing would be done and program execution would continue in its normal sequence.

- (6%) List three network topologies. . (4%) Identify two protocols used in networks to determine the right to transmit an original message.
- (16%) Briefly summarize the steps performed by each of the four layers in the network hierarchy at which a message originates.
- (4%) When searching within the list
Lewis, Maurice, Nathan, Oliver, Pat, Quincy, Roger, Stan, Tom
which entry will be found most quickly using the binary search algorithm?
- (5%) What is the average sorting time for a list of N elements using insertion sort? (5%) What is the worst case search time for a list of 6000 elements using binary sort?
- (5%) List two disadvantages of both machine languages and assembly languages that are overcome by high-level programming languages.
1. (8%) Describe iterative and recursive approach. Give an example for both approaches.
2. (2%) Circle the portion of the program below in which control of the loop is initialized.

Draw a rectangle around the portion in which the test for termination is performed.

Underline the portion in which the state of the loop is moved toward the termination condition.

```
X ← 3;  
while (X < 9) do  
    (X ← X + 1)
```

3. (6%) What sequence of values will be printed when the following instructions are executed?

```
X ← 5;  
while (X < 7) do  
    (print the value of X;  
    X ← X + 1)  
print the value of X;  
while (X > 2) do  
    (print the value of X;  
    X ← X - 2)
```

A
B
C
D
E