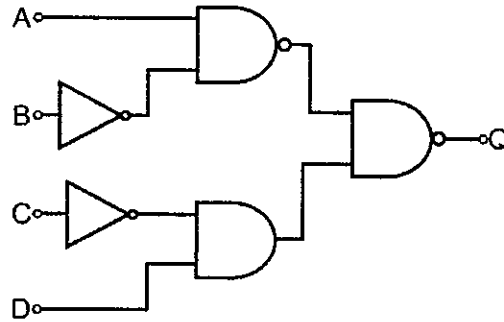


1. Consider the following logic circuit, derive the function Q in terms of A, B, C, D. (5%). Using the de Morgan's theorem, find the simplest form of the function Q (5%).



2. Consider the following grammar:

$$S \rightarrow AB\$ \quad (1)$$

$$A \rightarrow xA \quad (2)$$

$$A \rightarrow B \quad (3)$$

$$B \rightarrow yzB \quad (4)$$

$$B \rightarrow z \quad (5)$$

- a) What are the terminals and non-terminals of this grammar? (5%)
- b) Show the parse tree for $xyzzz\$$. (5%)
3. Using the RSA encryption algorithm, pick the prime numbers $p = 11$ and $q = 7$. Find a set of encryption/decryption keys e and d . (10%)
4. The keys 12, 18, 13, 2, 3, 23, 5 and 15 are inserted into an initially empty hash table of length 10 using open addressing with hash function $h(k) = k \bmod 10$ and linear probing. What is the resultant hash table? (10%)
5. Consider a 10 Mbps Ethernet LAN that has stations attached to a 2.5 km long coaxial cable. Given that the transmission speed is 2.3×10^8 m/sec, the packet size is 128 bytes out of which 30 bytes are overhead, and the efficiency is 59%, answer the following questions.
- a) What is the transmission delay? (3%)
- b) What is the propagation delay? (3%)
- c) What is the effective transmission rate? (4%)
6. Assume that a 12-bit Hamming codeword consisting of 8-bit data and 4 check bits is $d_8d_7d_6d_5c_8d_4d_3d_2c_4d_1c_2c_1$, where the data bits and the check bits are given in the following tables. What are the values of A and B? (10%)

Data bits							
d_8	d_7	d_6	d_5	d_4	d_3	d_2	d_1
1	1	0	A	0	1	0	1

Check bits			
c_8	c_4	c_2	c_1
B	0	1	0

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7. The preorder traversal sequence of a binary search tree is:

30, 20, 10, 15, 25, 23, 39, 35, 42

- a) Draw the binary search tree. (5%)
b) What is the postorder traversal sequence of the same tree? (5%)
8. Find the arithmetic expression for the following assembly code. (10%)

MOV	AX, A
MOV	BL, B
ADD	AX, 2
MOV	CL, 3
SUB	BL, CL
DIV	BL
MOV	SUM, AL

9. Write a program which sorts the following data in ascending order using the selection sort algorithm. You may use any computer programming language for this problem. (10%)

20	12	10	15	2
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10. A pair of positive integer numbers are called twin primes if they are both prime numbers and the difference between them is 2, i.e., they are consecutive odd numbers and they are prime numbers. (3, 5), (5, 7) and (11, 13) are three examples of such pair of twin prime numbers. Write a program to display all the pairs of twin prime numbers that are less than 10000. You may use any computer programming language for this problem. (10%)

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