1. (20%) Answer the following questions briefly.
   (a) $(AD)_{16} \times (A)_{16} = (\quad)_{16}$
   (b) Simplify the Boolean expression f(x, y, z) = $xyz + xy\bar{z} + \bar{x}y\bar{z}$ with a minimum number of + and • operations.
   (c) Derive the asymptotic complexity of recurrence relation T(n) = T(n/2) + n.
   (d) Given two polynomials *A* and *B* with *m* and *n* terms, respectively. What are the upper and lower bounds to add coefficients for two terms with the same exponent when polynomial manipulations are implemented by linked-list?

2. (10 %) Implement a full adder circuit with a decoder and some OR gates.

3. (10%) Explain that in some situations a low-level language maybe more appropriate than a high-level programming language. Do you think assembly language will disappear in the information industry within 10 years? Elaborate your answer.

4. (10%) Given the post-order sequence being (**DEBHGFCA)** and the in-order sequence being (**DBEACHGF**), reconstruct the binary tree.

5. (15%) Design an algorithm for determining whether a given positive integer (the input value) is prime. How does the time required by your algorithm depend on the value of the input? (You can use C language or pseudocode.)

6. (10%) What are the differences between a linker list and a stack?

7. (15%) Write a program that prints the following patterns separately one below the other. Use for loops to generate the patterns. All asterisks (*) should be printed by a single printf statement of the form printf("*").

```
(A)                (B)
*                **********
**                *********
***               ********
****              *******
*****             ******
******            *****
*******           ****
********          ***
*********         **
**********        *
```

8. (10%) Briefly explain the difference between static and dynamic data structures and give an example for each.