國立中央大學　資訊工程學系
102 學年度 碩士在職專班 招生入學考試命題紙

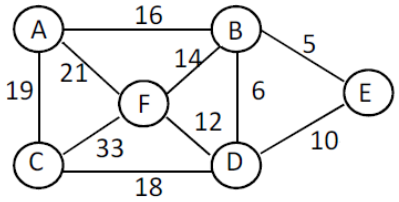
一、單選題 (75%)

1. For a binary tree with the depth of 6, the maximum number of nodes will be?
   (A) 32 (B) 31 (C) 64 (D) 63

2. What is the worst-case running time of Remove(x) for a linked list?
   (A) O(1)　(B) O(log n)　(C) O(n)　(D) $O(n^3)$

3. How many binary trees can be constructed with 5 nodes. (A)120 (B)5 (C) 50 (D) 42

4. Which edge will not be included into the following graph's minimal cost spanning tree?
   (A) CF　(B) AB　(C) BE　(D) DF



5. Let G=(V,E) be an undirected graph with n vertices, where n>=1, and A be the adjacent matrix of G. Which of the following statement is not correct?
   (A) A is symmetric
   (B) A is a 2-dimension n*n array
   (C) The degree of any vertex, I, is equal to ith row sum.
   (D) The number of the edges of G is equal to $\sum_{i=1}^{n}\sum_{j=1}^{n}A(i,j)$

6. Which of the following sorting algorithm is stable?
   (A) Selection sort (B) Insertion sort (C) Quick sort (D) Heap sort

7. Which of the following statement is true?
   (A) Greedy algorithms always yield optimal solutions
   (B) A list of integers is maintained in an array. The complexity of printing the second largest element in the array is $O(n^2)$
   (C) The adjacency matrix for a directed graph must by symmetric
   (D) A simple path is a path in which all vertices, including the first and the last, are distinct

8. Which sorting method is the slowest one in worst-case behavior?
(A) merge sort (B) heap sort (C) quick sort (D) radix sort

9. Which data structure is the best in representing the sparse matrices?
(A) tree (B) link list (C) array (D) queue (E) stack

10. Which of the following is not equivalent to 14 in decimal?
(a)$(1110)_2$ (b)$(E)_{16}$ (c)$(15)_8$ (d)None of the above

11.How many symbols can be represented by a bit pattern with eight bits?
(a)128 (b) 256 (c)512 (d)1024

12.Which one is equivalent to 8K? (A) 2^{12} (B) 2^{13} (C) 2^{14} (D) 2^{15}

13.Which one cannot access data randomly? (A) RAM (B) H.D.D. (C) Tape (D) ROM

14.Which one would not erase data after turning off the power?
(A) Virtual memory (B) BIOS (C) SRAM (D) DRAM

15. Which one is equivalent to $(10110.11)_2$?
(A)$(24.85)_{10}$ (B) $(25.85)_{10}$ (C) $(22.75)_{10}$ (D) $(24.75)_{10}$

16. In Boolean logic, which one is true? (A) 0+1=0 (B) 1+1=0 (C) 1・0=0 (D) 1・1=0

17. The submask of ClassB should be
(A) 255.0.0.0 (B) 255.255.0.1 (C) 255.255.0.0 (D) 255.255.255.0

18. Which one is the file transfer protocol？(A) FET (B) PTF (C) FTP (D) FILS

19. Which one is the fastest in accessing data? (A) RAM (B) Register (C) Cache (D) Hard Disk

20. Which one port can link to the most devices? (A) LPT 1 (B) IEEE 1394
(C) COM 2 (D) USB

21. Which one is not belong to the machine cycle in CPU？
(A) Fetch (B)Encode (C) Decode (D) Execute

22. How many layers in Open System Interconnection? (A) 6 (B)7 (C) 8 (D) 9

23. How many bits of a IP address in TCP/IP？ (A) 8 (B) 16 (C) 32 (D) 64

24. Which one doesn't belong to the network topology？
(A)star (B) ring (C) circle (D) tree

25. The smallest storage area on a magnetic disk that can be accessed at one time is a _____? (A)track (B)sector (C)frame (D)head

二、問答題 (25%)

1. Bubble Sort is a simple-minded algorithm for sorting. Suppose *A* is an array with *N* values, and we want to sort *A* in ascending order. Please write a pseudocode with Bubble Sort.

2. Show that if we are given the preorder and the inorder of the nodes of a binary tree, the binary tree structure may be constructed.

3. The following shows an algorithm to build a minimum-cost spanning tree T from graph with edge set E and n vertices.

```
T:=0
While T contains less than n-1 edges and E not empty do begin
      choose an edge (v,w) from E of lowest cost;……..(1)
      delete (v,w) from E; ……(2)
      if (v,w) does not create a cycle in T ……..(3)
            then and (v,w) to T ……(4)
      else    discard (v,w);
end;
if T contains fewer than n-1 edges then writeln ("no spanning tree");
```

(A) Propose a data structure for E such that the two functions (1) and (2) can be performed efficiently.
(B) Propose a data structure for T such that the two functions (3) and (4) can be performed efficiently.

4. Sort the sequence 8,4,1,9,2,1,7,4,1 using the (A) selection sort and (B) insertion sort. You should show the list at the end of each pass.

5. Addition and subtraction of real numbers stored in floating-point numbers is reduced to addition and subtraction of two integers stored in sign-and-magnitude (combination of sign and mantissa) after the alignment of decimal points. Show how the computer finds the result of (5.75) + (161.875).