※注意：選擇題部分請於試卷之「選擇題作答區」內作答

● 1至15爲單選選擇題(每題5分，答錯不倒扣. Also, "x mod y" means "the remainder after x is divided by y". For example, 8 mod 5=3, 27 mod 5=2, and 20 mod 5=0.)

Questions 1 and 2: The following items are ordered by their asymptotic growth rates as $X_1 < X_2 < X_3 < X_4 < X_5$

(i) (n-1)!　(ii) $4^{\lg n}$　(iii) $(\lg n)^{\lg n}$　(iv) $(\frac{4}{3})^n$　(v) lg(n!)

1. What is X_2?

(A) (n-1)!　(B) $4^{\lg n}$ (C) $(\lg n)^{\lg n}$　(D) $(\frac{4}{3})^n$　(E) lg(n!)

2. What is X_4?

(A) (n-1)!　(B) $4^{\lg n}$ (C) $(\lg n)^{\lg n}$　(D) $(\frac{4}{3})^n$　(E) lg(n!)

Questions 3 and 4: Let A=1, B=2, C=3, D=4, and E=5.

3. Let the value of the postfix expression:

$AB+D\times EBA//+AD\times C/+CD\times+A-B+CD\times-$

be y. Then, y mod 5=?

(A) 0　(B) 1　(C) 2　(D) 3　(E) 4

4. Let the value of the prefix expression: $+\times+ABC\times+\times D\times E+DE\times ABC$ be z. Then, z mod 5=?

(A) 0　(B) 1　(C) 2　(D) 3　(E) 4

Questions 5 and 6: Let $X_1X_2\cdots\cdots X_{13}$ be the postorder traversal of a binary tree which has the following information.

Its inorder traversal: CAEDFBGHKJILM

Its preorder traversal: BACDEFIHGJKLM

Then,

5. X_3 =

(A) C　(B) F　(C) D　(D) I　(E) 以上皆非

6. X_6 =

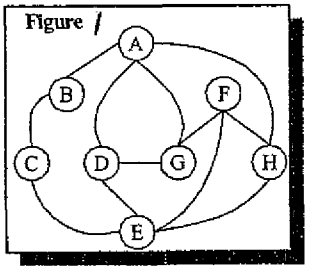
(A) C　(B) F　(C) D　(D) I　(E) 以上皆非

7. Let $X_1X_2\cdots\cdots X_8$ be the order of nodes visited by applying BFS in Fig 1, starting from node A (visited in the lexical order), X_6 = ?

(A) A　(B) C　(C) D　(D) G　(E) 以上皆非

8. Let $X_1X_2\cdots\cdots X_8$ be the order of nodes visited by applying DFS in Fig 1, starting from node A (visited in the lexical order), X_6 = ?

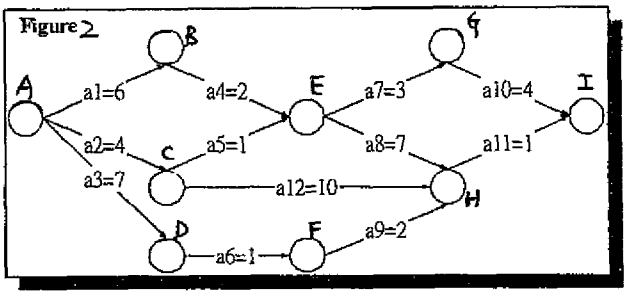
Figure 1



(A) A　(B) C　(C) D　(D) G
(E) 以上皆非

接背面

Questions 9 and 10: Suppose an AOE network is shown in Figure 2



9. Let e(i) denote the earliest time of activity a_i.
What is (e(11) mod 5)?
(A) 0 (B) 1 (C) 2 (D) 3
(E) 4

10. Let l(i) denote the latest time of activity a_i. What is (l(9) mod 5)?
(A) 0 (B) 1 (C) 2 (D) 3 (E) 4

11. Suppose a tree with only one node is defined to be with height 1. Let x be the maximum height of an AVL tree with 400 nodes. Then, x mod 5=?
(A) 0 (B) 1 (C) 2 (D) 3 (E) 4

12. Suppose a tree with only one node is defined to be with height 1. Let y be the minimum height of an AVL tree with 400 nodes. Then, y mod 5=?
(A) 0 (B) 1 (C) 2 (D) 3 (E) 4

13. Let b be the number of different ways we can perform the multiplications for the product of 6 matrices: $M_1 \times M_2 \times \cdots\cdots \times M_6$. Then b mod 5 =?
(A) 0 (B) 1 (C) 2 (D) 3 (E) 4

Questions 14 and 15: Let T_B be the binary tree representation of B(T_1,T_2,T_3)

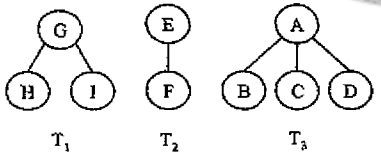


Figure 3

14. Let $X_1X_2\cdots\cdots X_9$ be the inorder traversal on this tree T_B. X_6 = ?
(A) H (B) I (C) B (D) A (E) 以上皆非

15. Let $Y_1Y_2\cdots\cdots Y_9$ be the postorder traversal on this tree T_B. Y_6 = ?
(A) H (B) I (C) B (D) A (E) 以上皆非

16、(共 25 分) By inserting the following items in order: 25, 14, 30, 18, 35, 7, 5, and 27, please construct and draw, respectively, (a) a deap (5%) (b) a min-max heap (10%) (c) AVL tree (10%)