

國立中央大學 113 學年度碩士班考試入學試題

所別：資訊管理暨大數據分析類

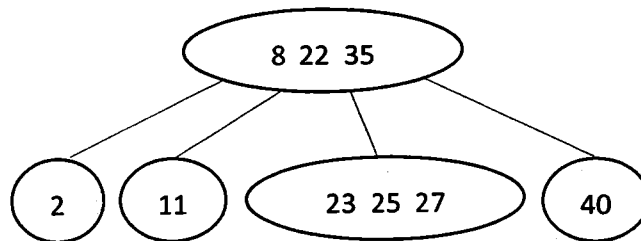
第1頁/共2頁

科目：資料結構

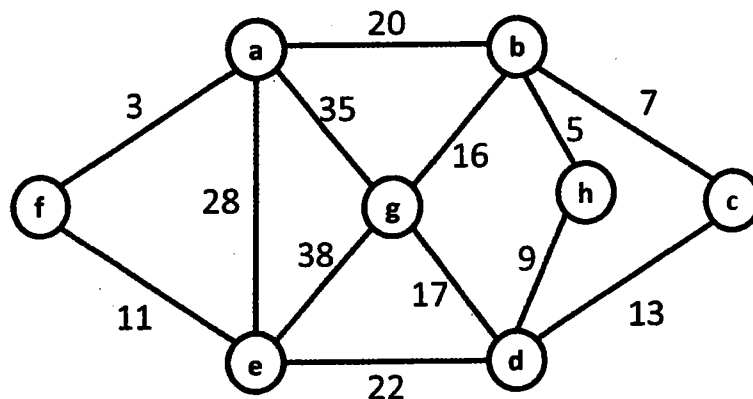
*本科考試禁用計算器

【題型說明：皆依題意為問答題或程式設計題】

1. What are the advantages and disadvantages of the linked linear list structure compared with the array structure? (3%)
2. We have a generalized list structure:
 - (a) Please use the structure to represent the following polynomials
 $P(x, y, z) = 2x^3yz^2 + 5x^5y^2z + 7x^3y^4z^6 + x^2y^3z$ (6%)
 - (b) What is the potential problem of the data structure? (4%)
3. Please draw the max-heap tree of the sequence numbers 4, 12, 1, 24, 6, 18, 21, 9, 5. (10%)
4. Redraw the following 2-3-4 tree after executing the operation insert(29). (10%)



5. Please refer to the graph below for this question.
 - (a) Please construct minimum spanning trees for the following graph. (6%)
 - (b) Please describe the procedure steps using Kruskal's algorithm (4%)
 - (c) Please describe the procedure steps using Prim's algorithm (Starting with node a) (4%)



注：背面有試題

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所別： 資訊管理暨大數據分析類

第 2 頁 / 共 2 頁

科目： 資料結構

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6. (a) Please convert the following postfix expression to prefix notation. (6%)
 $ab+c/d*e+5-$
(b) Please convert the following prefix expression to postfix notation. (6%)
 $*-a/bc-/xyz$
7. (a) Please define what a recursive function is? (3%)
(b) What are the advantages of recursive functions? (2%)
(c) What are the disadvantages of recursive functions? (2%)
8. Consider a hash table with the following characteristics: size = 10, hash function $h(k) = k \% 10$, and using open addressing with linear probing as the collision resolution strategy. Insert the keys 25, 35, 14, 5, 16, 26, and 19 into the hash table. Show the resulting hash table after each insertion and demonstrate how linear probing resolves collisions. (10%)
9. Explain the concept of collision handling in hashing. Discuss the various collision handling techniques, including separate chaining and open addressing. Provide detailed examples illustrating how each technique works and highlight their advantages and disadvantages. (10%)
10. You are asked to design a database management system that efficiently stores and retrieves data using **AVL trees for indexing**. Assume that the database contains information about patients, where each record has the following attributes:

Patient ID (integer)
Name (string)
Weight (floating-point number)

You are required to implement an AVL tree-based indexing system for the Patient ID attribute. Additionally, you need to perform specific operations such as insertion and deletion on this AVL tree. Explain the operations in your implementation with examples. (14%)

注意：背面有試題