

國立中山大學 108 學年度 碩士暨碩士專班招生考試試題

科目名稱：作業系統與資料結構【資工系碩士班甲組】

—作答注意事項—

考試時間：100 分鐘

- 考試開始響前不得翻閱試題，並不得書寫、劃記、作答。請先檢查答案卷（卡）之應考證號碼、桌角號碼、應試科目是否正確，如有不同立即請監試人員處理。
- 答案卷限用藍、黑色筆(含鉛筆)書寫、繪圖或標示，可攜帶橡皮擦、無色透明無文字墊板、尺規、修正液（帶）、手錶(未附計算器者)。每人每節限使用一份答案卷，不得另攜帶紙張，請斟酌作答。
- 答案卡請以 2B 鉛筆劃記，不可使用修正液（帶）塗改，未使用 2B 鉛筆、劃記太輕或污損致光學閱讀機無法辨識答案者，其後果由考生自行負擔。
- 答案卷（卡）應保持清潔完整，不得折疊、破壞或塗改應考證號碼及條碼，亦不得書寫考生姓名、應考證號碼或與答案無關之任何文字或符號。
- 可否使用計算機請依試題資訊內標註為準，如「可以」使用，廠牌、功能不拘，唯不得攜帶具有通訊、記憶或收發等功能或其他有礙試場安寧、考試公平之各類器材、物品（如鬧鈴、行動電話、電子字典等）入場。
- 試題及答案卷（卡）請務必繳回，未繳回者該科成績以零分計算。
- 試題採雙面列印，考生應注意試題頁數確實作答。
- 違規者依本校招生考試試場規則及違規處理辦法處理。

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科目名稱：作業系統與資料結構【資工系碩士班甲組】

題號：434003

※本科目依簡章規定「不可以」使用計算機(問答申論題)

共 2 頁第 1 頁

1. [Basic Data Structures: 20%]

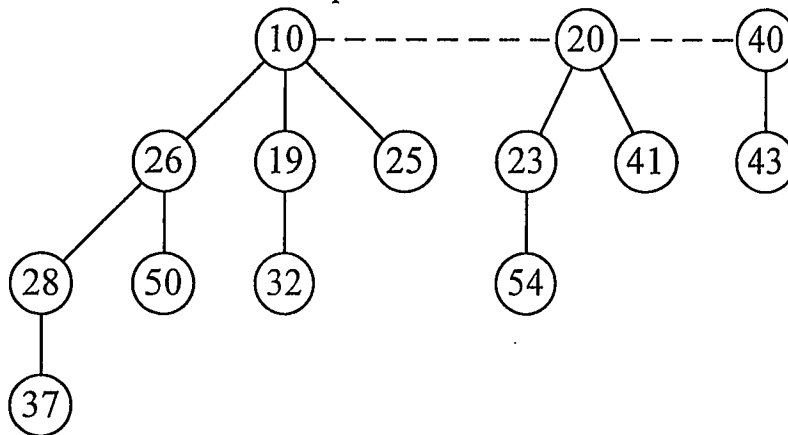
- (1) Given a prefix expression “+ + (18) × (17) (16) × + × (15) (14) (13) (12)”, convert it to an infix expression and calculate the result. (4%)
- (2) What is simple uniform hashing? Given a hash table with m slots that stores n elements, what is the expected time spent by a failed search if hash collisions are solved by chaining? (4%)
- (3) Except that every node is either red or black, how do you make a binary search tree become a red-black tree? (4%)
- (4) Given n objects to be sorted, show the average-case running time of the following algorithms: Heap sort, insertion sort, bubble sort, and quick sort. (4%)
- (5) Given the adjacency matrix of an undirected graph:

	A	B	C	D	E	F	S
A	0	1	1	0	0	0	0
B	1	0	1	1	0	0	0
C	1	1	0	1	1	1	0
D	0	1	1	0	0	1	0
E	0	0	1	0	0	1	1
F	0	0	1	1	1	0	1
S	0	0	0	0	1	1	0

Show the sequence of nodes that you visit by using breadth-first search and depth-first search. If there are multiple choices to select nodes, just follow the alphabetical order. (4%)

2. [Advanced Data Structures: 20%]

- (1) Given a directed graph $G = (V, E)$, what is its strongly connected component? (4%)
- (2) Using a B-tree to maintain disk blocks helps reduce the cost of disk access. Why? (4%)
- (3) What is the difference between a B^+ -tree and a B^* -tree? (4%)
- (4) What are the two properties of a binomial-heap? (4%)
- (5) Consider a Fibonacci heap as follows:



The number in each node gives its key value. Suppose that we decrease key 50 to 18 and then decrease key 37 to 7. Show the result of the revised heap. (4%)

3. [Process and Synchronization: 20%]

- (1) What is a race condition? How to solve it? (4%)
- (2) What is the difference between deadlock prevention and deadlock avoidance? (4%)
- (3) When will you need to use a condition variable? (4%)
- (4) What is the difference between asynchronous and deferred cancellation of a target thread? (4%)
- (5) What are the four common conditions to cause process termination? (4%)

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共 2 頁第 2 頁

4. [Memory and I/O: 20%]

- (1) Give two benefits of using paging. (4%)
- (2) What are the working set and trashing? (4%)
- (3) What is the difference between external and internal fragmentation? (4%)
- (4) What is the difference between synchronous and asynchronous I/O? (4%)
- (5) What are the four common registers for an I/O device? (4%)

5. [Protection and Security: 20%]

- (1) What is the principle of least privilege? How does Solaris 10 system implement it? (4%)
- (2) What is the difference between a computer virus and a computer worm? (4%)
- (3) Give two common solutions to deal with the setuid-on problem in UNIX. (4%)
- (4) What are masquerading and replay attack? (4%)
- (5) What is the purpose of authentication? What is non-repudiation? (4%)