

國立高雄第一科技大學 97 學年度 碩士班 招生考試 試題紙

系 所 別：電腦與通訊工程系

組 別：電腦組

考科代碼：2122

考 科：計算機概論

注意事項：

- 1、本科目不可使用本校提供之電子計算機。
- 2、請於答案卷上規定之範圍作答，違者該題不予計分。

1. Show that the following statements are correct:

(1) If $f(n) = a_m n^m + \dots + a_1 n + a_0$, then $f(n) = O(n^m)$. (4%)

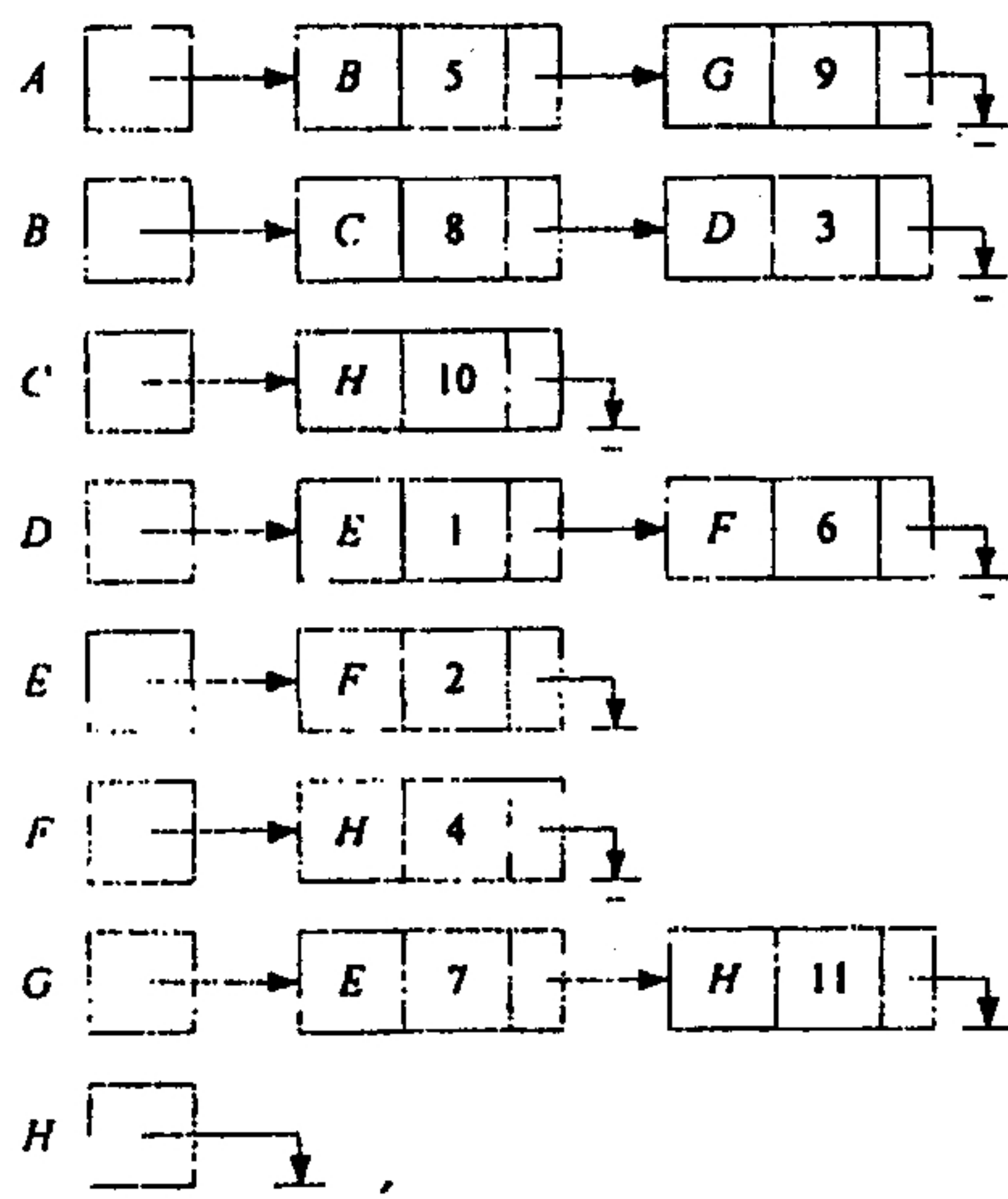
(2) $\sum_{k=1}^n \frac{1}{k} = \Theta(\ln n)$. (4%)

2. Answer the following questions about stacks and queues:

(1) Show how to implement a stack using two queues. (4%)

(2) Show how to implement a queue using two stacks. (4%)

3. Given an adjacency list shown below. The value field in element of the adjacency list contains edge weight of a graph.



(1) Draw the corresponding graph. (4%)

(2) Please find a topological sort of the given graph. (4%)

(3) Apply Dijkstra's shortest-path algorithm to determine the shortest paths from vertex A to every other vertex in the graph. Show your work step by step. (4%)

4. Suppose you are given the following numbers:

15, 22, 13, 27, 12, 10, 20, 25

(1) Construct a binary search tree for these numbers presented given order. Please draw the resulting tree T_b . (4%)

(2) Represent the completed threaded version of T_b . (4%)

(3) Delete 22 from T_b and show the resulting tree. (4%)

5. An unsorted sequence 15, 22, 13, 27, 12, 10, 20, 25 is stored in an array and to be sorted in increasing order.

(1) Demonstrate the contents of the array in the first pass of radix sort (with radix=10). (4%)

(2) Demonstrate the contents of the array in the first pass of quick sort (use first item as the pivot). (4%)

(3) Demonstrate the contents of the array in the first pass of heap sort. (4%)

6. Answer the following questions about CPU-scheduling algorithms:

(1) What is starvation? Which CPU-scheduling algorithm has a possibility of starvation? (4%)

(2) What are the advantages and disadvantages of the FCFS (First-Come-First-Served) scheduling algorithm? (4%)

(3) Why the performance of the RR (Round Robin) scheduling algorithm depends heavily on the size of the time slice? (4%)

7. What are the differences between paging and segmentation? Please detail your answer. (8%)

8. There are three popular methods to allocate disk blocks for a file: contiguous, linked, and indexed. Give advantages and disadvantages of each method. (8%)

9. Consider the following snapshot of a system:

	Allocation				Max				Available			
	A	B	C	D	A	B	C	D	A	B	C	D
P_1	1	2	1	0	1	3	2	2	1	X	1	2
P_2	5	1	3	0	7	7	3	0				
P_3	2	1	4	2	3	6	6	6				
P_4	5	3	0	2	5	5	6	5				
P_5	1	4	2	0	5	4	3	1				

(1) Let X be the smallest value in which the system state is safe. What is X? (4%)

(2) If a request from process P_2 arrives for (1, 2, 1, 1), can the request be granted immediately? Explain your answer. (4%)

(3) If a request from process P_3 arrives for (0, 1, 0, 2), can the request be granted immediately? Explain your answer. (4%)

10. Consider the following solution for the producer/consumer problem:

<pre>const int sizeofbuffer = ...; /* buffer size */ semaphore s = 1; semaphore n = 0; semaphore e = sizeofbuffer; void producer(){ while(true){ produce(); wait(s); wait(e); append(); signal(s); signal(n); } }</pre>	<pre>void consumer(){ while(true){ wait(n); wait(s); take(); signal(s); signal(e); consume(); } } void main(){ parbegin(producer, consumer); }</pre>
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Determine whether it is a correct solution to the producer/consumer problem. Please detail your reasons. (8%)