I. Information Network Problem: (25 points)

1. Explain why fiber optics can transmit more data in a second than other media. (6%)
2. How are packet priorities implemented in IEEE 802.5 Token Ring networks? (10%)
3. Name three Internet applications. (3%) Give their transport layer protocols and network layer protocols respectively. (6%)

II. Database Problem: (25 points)

db1.

有一個表格

\[ R(A, B, C, D) \]

其 Functional Dependencies 爲:

\[ A \rightarrow B \]
\[ BC \rightarrow D \]
\[ D \rightarrow B, C \]
\[ C \rightarrow A \]

請回答下列兩子題。

(a) 找出此表格所有的 candidate keys (8%)

(b) 若將此表格切割為

\[ R_1(A, B) \]
\[ R_2(B, C, D) \]

問此切割是否是 lossless切割？（請說明理由）（7%）

\[ db2. (10\%) \]

請扼要說明 bottom-up conceptual design (設計資料庫的 conceptual schema) 的方法。（即由 Teorey和Fry在1982年提出的 view integration的方法）

III. Algorithm Problem: (25 points)

1. State the process that uses dynamic programming method to find the optimal search tree if the probabilities associated with five keys \( c_1 \) to \( c_5 \) are \( p_1=0.30, p_2=0.05, p_3=0.08, p_4=0.45, p_5=0.12 \). (13%)

2. An array is used to store an unsorted sequence 26, 05, 77, 01, 61, 11, 59, 15. Write the contents of the array after the first two passes of heapsort, mergesort, and quicksort, where they are sorted in increasing order. (12%)
Write the contents of the array after the first two passes of heapsort, mergesort, and quicksort, where they are sorted in increasing order. (12%)
IV. Operating Systems Problem: (25 points)

(a) What is Belady's anomaly? (10%)
(b) Describe two feasible implementations for LRU page-replacement algorithm. You may give simple examples to illustrate the implementations. (15%)
命題講句超出線外