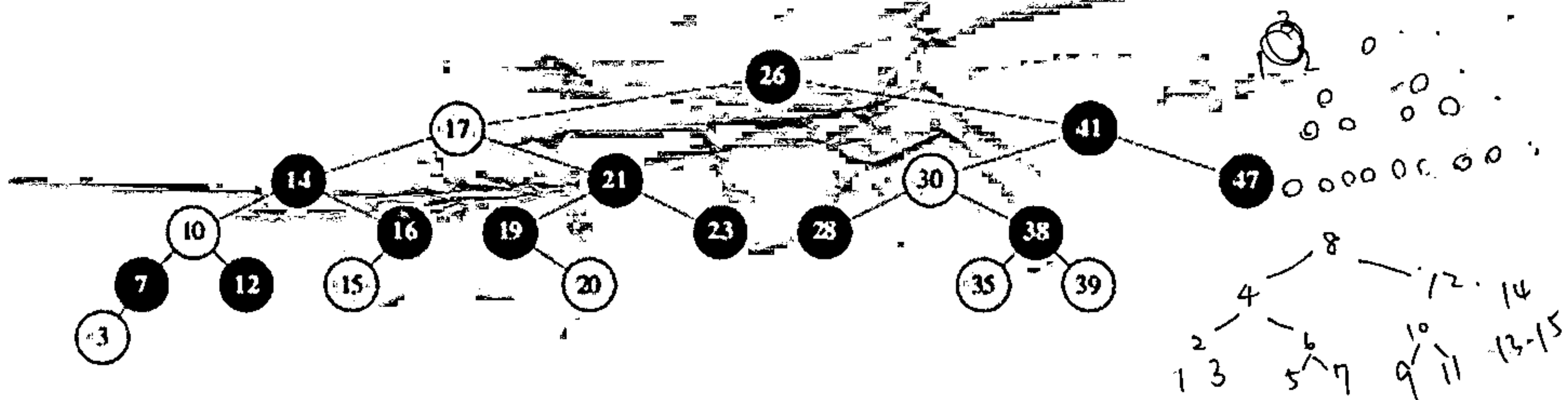


資訊工程系【演算法概論】期末考

1. For the set of $\{1, 4, 5, 10, 16, 17, 21\}$ of keys, draw binary search trees of heights 2, 3, 4, 5, and 6. (15%)
2. Suppose that we have numbers between 1 and 1000 in a binary search tree, and we want to search for the number 363. Which of the following sequences could not be the sequence of nodes examined? (15%)
 - (a) 2, 252, 401, 398, 330, 344, 397, 363.
 - (b) 924, 220, 911, 244, 898, 258, 362, 363.
 - (c) 925, 202, 911, 240, 912, 245, 363.
 - (d) 2, 399, 387, 219, 266, 382, 381, 278, 363.
 - (e) 935, 278, 347, 621, 299, 392, 358, 363.
3. What are the *red-black properties* of a red-black tree? (10%)
4. In the style of the following figure, draw the red-black trees on the keys $\{1, 2, \dots, 15\}$ such that their black-heights are 2, 3, and 4 respectively. (15%)



5. Using dynamic programming to find an optimal parenthesization of a matrix-chain product whose sequence of dimensions is $\langle 5, 10, 3, 12, 5, 50, 6 \rangle$. Please construct the m and s tables in your answer. (15%)
6. Using Greedy algorithm to find an optimal Huffman code for the following set of frequencies. (15%)

a:1 b:1 c:2 d:3 e:5 f:8 g:13 h:21
7. In the amortized analysis of a dynamic table, we should double the table size upon inserting an item into a full table and halve the size

$5 \times 10 \times 3 =$