

中央警察大學 105 學年度碩士班入學考試試題

所 別：資訊管理研究所

科 目：計算機概論

作答注意事項：

1. 本試題共 4 題，每題各占 25 分；共 2 頁。
2. 不用抄題，可不按題目次序作答，但應書寫題號。
3. 禁用鉛筆作答，違者不予計分。

一、

- (一) In the view of data searching, define the HASH function in this way. And give an efficient algorithm in HASH function usage, in conjunction with a set of 15 keywords. (8 分)
- (二) Give two more data search algorithms besides HASH manner, in examples, respectively. (8 分)
- (三) Evaluate the time complexities in the general cases as the three algorithms mentioned above. (9 分)

二、Explain the Pigeonhole Principle in the fundamental computer science. Assume that there are 132 balls to put into 77 boxes, where one box contains at least one ball. Discuss a fact that there are exactly 21 balls which are assigned into the consecutive boxes.

三、Do the following tasks. Show your work.

- (一) Convert the decimal 15 and -12 into 8-bit 2's complement number and hexadecimal numbers. (8 分)
- (二) What is an overflow? Provide an example using 4-numbers. (8 分)
- (三) Convert 47.365 into a binary scientific notation (i.e., $\pm 1.xxxx \times 2^Y$) (9 分)

四、Let $G = (V, E)$ be a directed graph where V represents vertices, and E represents edges. $E = \{(1,2), (3,2), (2,3), (1,3), (2,4), (3,4)\}$. Each pair (i, j) in E means that there is an arc from node i to node j .

- (一) Please draw the directed graph and write in-degree and out-degree of each vertex. (8 分)
- (二) Please find the shortest path from node 1 to node 4. (8 分)
- (三) Please find the minimal spanning tree. (9 分)