

國立臺灣科技大學

八十九學年度碩士班招生考試試題

系所組別：資訊管理系甲組、資訊管理系丙組

科目：計算機概論

1. (20%) Let triple (x, y, z) represent that there is an undirected edge connecting nodes x and y with weight z . There is a graph with seven nodes numbered from 0 to 6 and nine edges, where the nine edges are $(0,1,28)$, $(0,5,10)$, $(1,2,16)$, $(1,6,14)$, $(2,3,12)$, $(3,4,22)$, $(3,6,18)$, $(4,5,25)$ and $(4,6,24)$. Use **Kruskal algorithm** and **disjoint set structure** with the weighting rule to find the minimum cost spanning tree, where the set with smaller root number will become the parent of the set with larger root number when either one can be the parent of the other in using the weighting rule. Show the process of selected edges and the contents of the disjoint set structure as follows:

step	edge	weight	result	disjoint set structure
1	(1,2)	16	added(or discard)	0 1 2 3 4 5 6

2. (1) (10%) The data are inserted in the sequence of 4, 2, 6, 5, 1, 7, 3, 8. Construct the corresponding **max heap** and **binary search tree**.
- (2) (5%) If the above data are the first data of eight runs sorted in increasing order, construct the corresponding **selection tree**.
3. (10%) The **working set model** is a technique used in virtual memory management system. Explain why this technique can solve the **thrashing problem**.
4. (10%) Explain the purpose of the **open** and **close** operations in a file system.
5. (10%) The **wait** and **signal** operations are two atomic operations of a **semaphore** which is a synchronization tool. Define the above two atomic operations.
6. (10%) The overall scenario for a large company to manage the enterprise-wide data resource is described as follows. The company still has numerous conventional file-based legacy information system applications both built in-house and purchased. There are also several operational databases that have been developed to support day-to-day operations and business transaction processing for those built-in and purchased information systems. As this company hesitates to give end-users access to operational database, instead data warehouses are developed for



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those fourth generation programming languages, query tools or decision support tools to generate queries and reports. Based on the description above, draw a diagram to illustrate the data architecture for this company.

7. (15%) Describe the features of the following Software Process Models (also known as Software System Development Methodology): the linear sequential model, the prototyping model and the component assembly model. And further compare the above models and name at least one software application that would be more suitable for them.
8. (10%) Name and draw diagrams for any three topologies of computer networks.

