1. Assume that an average Simple Network Management Protocol (SNMP) response message is 150 bytes long. Assume that a manager sends 200 SNMP *Get* commands each second.

   (a) (2%) What percentage of a 1 Gbps LAN link's capacity would the response messages represent?

   (b) (2%) What percentage of a 1 Mbps WAN link's capacity would the response messages represent?

   (c) (3%) What can you conclude from your answers to this question?

2. (9%) Please explain how to implement Virtual Local Area Network (VLAN) at a variety of layers. Please explain for each layer.

3. (4%) We have a digital medium with a data rate of 150 Mbps. How many 64-kbps voice channels can be carried by this medium if we use Direct Sequence Spread Spectrum (DSSS) with the Barker sequence of length 11?

4. (a) (3%) Does a Voice over IP (VoIP) transport packet use UDP or TCP? Explain why.

   (b) (6%) If you are encouraged to develop a new protocol to solve the problems occurred in the above scenario, please propose your design.

5. Suppose your company has an 18-bit network part of IPv4 address.

   (a) (2%) How many bits of subnet part would you select to provide at least 14 subnets?

   (b) (2%) How many hosts can you have per subnet?

6. (6%) Describe the concept and high-level architecture of Software-Defined Networking (SDN).

7. (8%) Discuss the required running times of Kruskal's algorhtm and Prim's algorithm for finding mimimum spanning trees. Use n as the number of nodes and m the number of edges in your answers.

8. (10%) On a social media, the acquaintance relation of n members is described by an undirected graph $G(V, E)$, where V is the member set and E is the edge set such that v_i and v_j of V know each other if and only if edge (v_i, v_j) is in E. Design an algorithm that finds all members reachable from member v_i with less than k edges. No members are printed more than once. Describe the data structures used in your algorithm.

9. (a) (6%) Discuss the advantages and disadvantages between linked lists and arrays for implementations of priority queues.

   (b) (4%) Give two application examples of priority queues.

國立交通大學 106 學年度碩士班考試入學招生試題

科目：資料結構與網際網路概論(5072)　　　　考試日期：106 年 2 月 9 日 第 3 節
系所班別：資訊管理與財務金融學系　　組別：資管碩甲組　　第 2 頁, 共 2 頁
【不可使用計算機】＊作答前請先核對試題、答案卷(試卷)與准考證之所組別與考科是否相符！！

10. (7%) The following table represents the contents of some cells in a computer's main memory along with the address of each cell represented. Note that some of the cells contain letters of the alphabet, and each such cell is followed by an empty cell. Place addresses in these empty cells so that each cell containing a letter together with the following cell form an entry in a linked list in which the letters appear in *alphabetical* order. (Use *zero* for the NIL pointer.) Also, what address should the head pointer contain?

Address	Contents
11	C
12	
13	G
14	
15	E
16	
17	B
18	
19	U
20	
21	F
22	

11. (10%) How would you design a stack which, in addition to the traditional *push* and *pop* operations, also supports and operation called *min* which returns the element having the minimum value in the stack? *push*, *pop*, and *min* should all roughly operate in $O(1)$ time.

12. A process that is waiting for a time slice is said to suffer *starvation* if it is never given a time slice.
    (a) (4%) Does a computer in a LAN running Ethernet (CSMA/CD) or running WiFi (CSMA/CA) suffer a *lower* probability of starvation (on the other hand, the other option suffers a higher probability of starvation) when she wants to successfully send out a message to a destination?
    (b) (4%) Justify your answer of part (a).

13. (a) (4%) In the public-key encryption, if Alice wants to communicate with Bob with guarantee of *confidentiality*, is she supposed to encrypt her message with her private key or Bob's public key?
    (b) (4%) If someone wants to identify her/himself for *authentication*, is she/he supposed to use her/his own private key or someone else's public key to create a digital signature for this purpose?

*** End of Test ***