國立中山大學資訊工程學系
105 學年度第 1 學期博士班資格考試

科目：電腦網路

1. Does packet switching guarantee delays, bandwidth, losses, or packet arrival order? If yes, please draw pictures to show why. If no, please also draw pictures to show why and explain how to improve delays, bandwidth, losses, and packet arrival order.
2. Encapsulation is commonly used in today's networking. Please describe four examples in networking which adopts the encapsulation technique.
3. Please write a pseudo code to show client-server socket interactions in TCP socket programming. Please also give remarks to explain your pseudo code for easy reading of your code.
4. Briefly explain the operations of TCP congestion control. Your explanation must include slow star phase, congestion avoidance phase, and the condition of experiencing losses.
5. There are seven layers in ISO/OSI model. Please explain them briefly from application layer to physical layer. What are the advantages of dividing the network protocol into layers? What are the possible problems behind it? Please also compare it with today's internet protocol stack.
6. Please briefly draw the architecture of a router, which includes input ports, output ports, processors, and the switching fabric. Please also explain each module and do not forget to explain input port functions and output port functions, which both consist of three main components.
7. What is CSMA/CD protocol in wired networks? Please draw a diagram to show the advantage of CSMA with collision detection (CD). What is CSMA/CA protocol in wireless networks? Please explain what hidden terminal problem is by drawing a picture. Please also explain what exposed terminal problem is by drawing a picture.
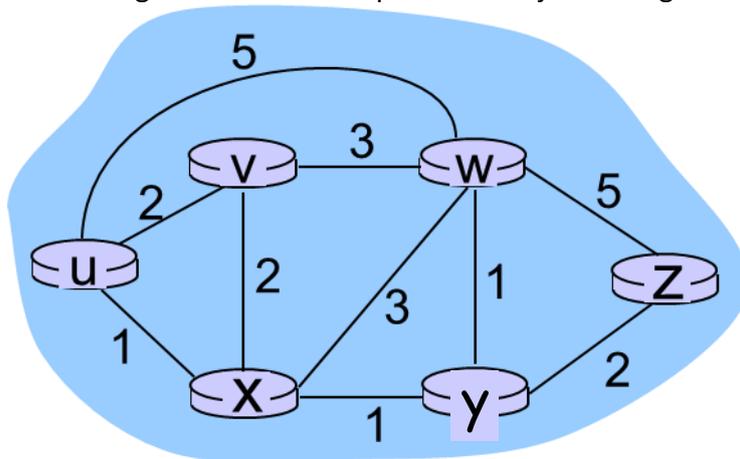8. Use Figure 1 below to explain how Dijsktra's algorithm works step by step.

Figure 1. A sample graph.
9. Please draw a graph to explain the operation of DOCSIS (Data over Cable Service Interface Spec). (Hint: DOCSIS is similar to LTE networks in making reservations for transmission frames).

10. Are the following figures for selective repeat correct? Please explain the operations of selective repeat by using those two figures, and please identify and correct errors if there are.

(a) sender view of sequence numbers

(b) receiver view of sequence numbers