Semester Two of Academic Year (2015---2016) of BDIC

《 Computer Networks》

Module Code: COMP2001J

Exam Paper A

Exam Instructions： **Answer 4 Questions**

Honesty Pledge：

I have read and clearly understand the Examination Rules of Beijing University of Technology and University College Dublin and am aware of the Punishment for Violating the Rules of Beijing University of Technology and University College Dublin. I hereby promise to abide by the relevant rules and regulations by not giving or receiving any help during the exam. If caught violating the rules, I would accept the punishment thereof.

Pledger： ___________ **Class No：** ___________

BJUT Student ID： ___________ **UCD Student ID**___________

Notes:

The exam paper has 5 questions on 7 pages, with a full score of 100 points. You are required to use the given Examination Book only.

Instructions for Candidates

Full marks will be awarded for complete answer to **4** questions.

Instructions for Invigilators

Candidates are allowed to use non-programmable calculators during this examination.

QUESTION 1

(a) With the help of a diagram list the layers in the TCP/IP communications model. Outline and discuss the functions implemented in each layer.

(5 marks)

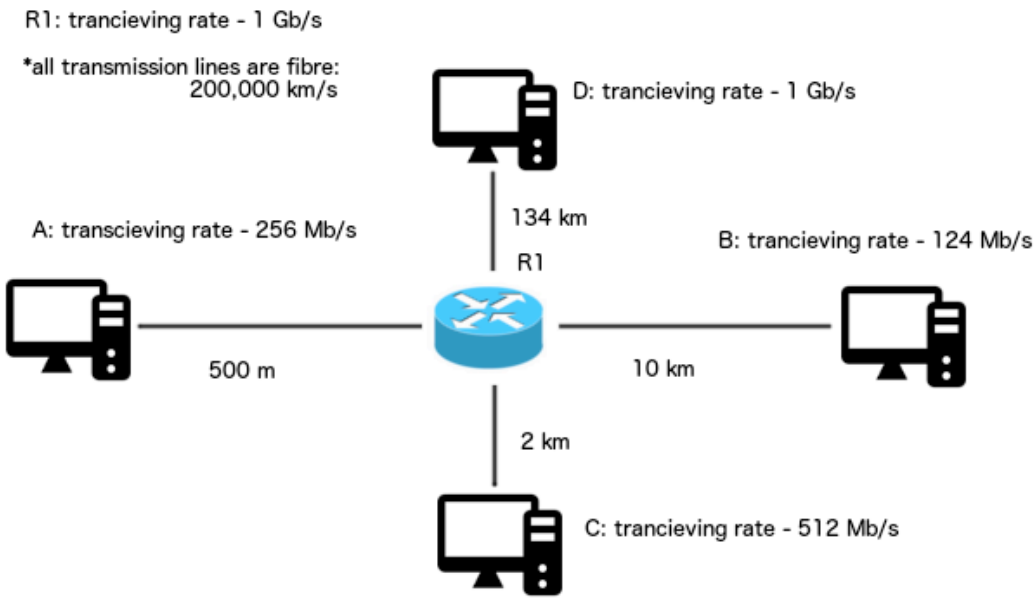
(b) Describe and detail the main reasons, in your opinion why it is necessary to break networks into separate subnets for efficient communication.

(6 marks)

(c) Explain what is meant by simplex, half duplex and full duplex communication.

(4 marks)

(d) Using the network shown and using First In First Out (FIFO) queuing in router R1. How much time will it take to send 5 packets of size 1000 bits from A to B, if C is also starts sending 5 packets, of size 1000 bits, to D at the same time.



(10 marks)

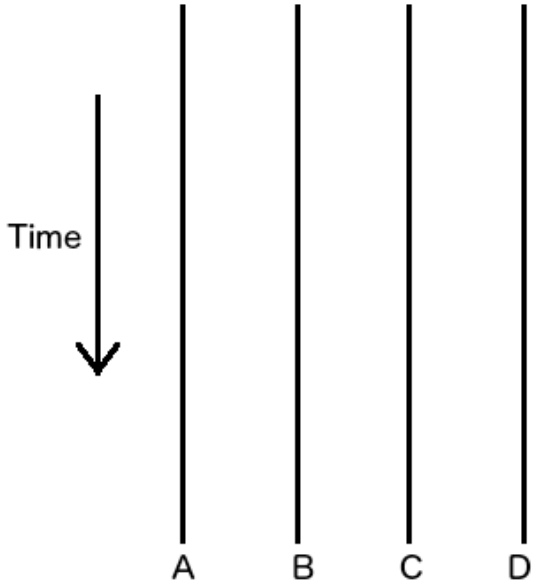
Total (25 marks)

QUESTION 2

(a) Draw a diagram of the Switching Backplane for a layer 2 switch. Explain how a switch is used to avoid packet collisions in the LAN?

(5 marks)

(b) Using the timing diagram template below, where A is the sender, D is the receiver and B and C are intermediate nodes, draw the timing sequence for Virtual Circuit Packet switching for three packets being sent from A to D.



(6 marks)

(c) Explain what is meant by the term baseband modulation in network computer networks. Describe in detail and using a diagram how Manchester Encoding encodes data on a signal.

(7 marks)

(d) Describe the concept of clock skew when sending data between two devices. When does clock skew become a problem? Explain how using Non Return to Zero Invert (NRZI) baseband encoding with 4B/5B Mapping will reduce the effect of clock skew when reading the data.

(7 marks)

Total (25 marks)

QUESTION 3

(a) Layer 2 CRCs are performed with generator polynomials. Why are these generator polynomials preferred to be a prime modulo-2 polynomial?

(5 marks)

(b) Using the Generator Polynomial G: 1101, generate the CRC for the Data M: 10111011 and construct the transmitted bits to be sent.

(6 marks)

(c) In CSMA multiple access techniques discuss the hidden node problem. When does this problem occur? Describe the CSAM-CA scheme and explain how this solves the hidden node problem.

(7 marks)

(d) Discuss the differences between CSMA-CD and Token Ring with regard to Maximum Medium Access Time (MMAT).

(7 marks)

Total (25 marks)

QUESTION 4

(a) A packet arrives at a router with a routing table as shown. For each IP address, what interface will the packet be forwarded to? Why is this interface chosen?

Routing Table:

Network	Interface
10.0.0.0 /8	2.1
172.59.0.0 /16	2.2
128.143.64.192 /26	3.1
172.59.36.156 /32	3.2
172.59.36.128 /25	3.3
172.59.36.192 /26	3.4
128.143.64.0 /24	1.2
0.0.0.0 /0	1.1

i. 172.59.36.143

ii. 128.143.44.128

iii. 172.59.36.156

(6 marks)

(b) Compare and contrast the main features of the Distance Vector Routing protocol and Link State Routing protocol?

(5 marks)

(c) The diagram below shows a network with link costs between routers. The routers share information using a Distance Vector routing protocol. All routers send the routing packets at the same time and at regular instances: t=1, t=2, t=3 etc.…. At t=0 all routers have directly connected routes in their routing tables. Show the routing tables for routers A,D and E directly after:

i. t = 1

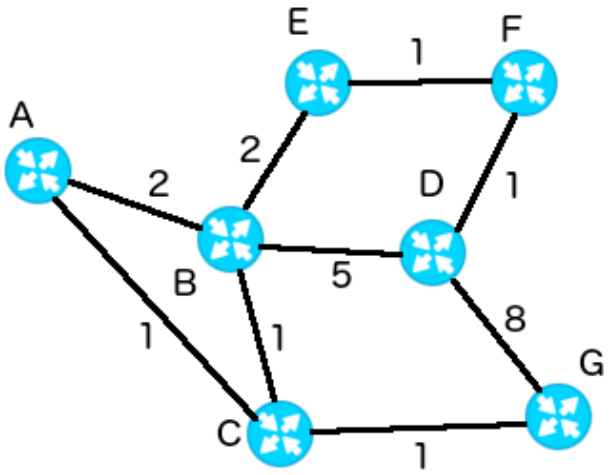
ii. t = 2

iii. t = 3

iv. t = 4

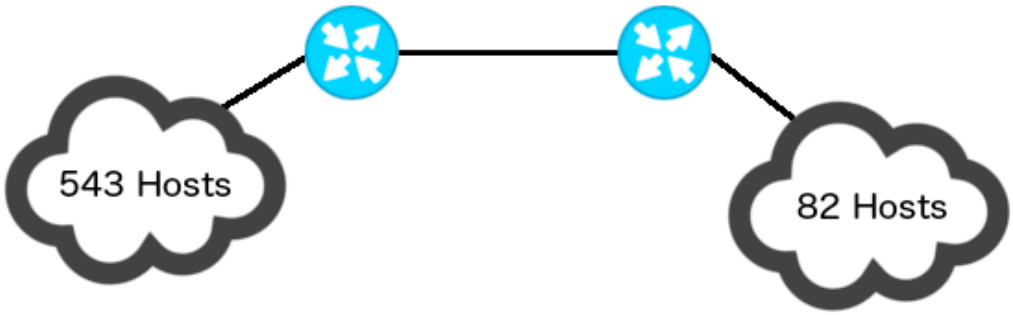
Routing Table (example):

Destination	Next Hop	Cost
G	D	10



(7 marks)

(d) You are given an IP range of 192.168.192.0/18. Design the IP network and subnet IP ranges required to facilitate the hosts shown in the figure below. Design the subnet ranges for maximum efficiency of use of IP addresses.



(7 marks)

Total (25 marks)

QUESTION 5

(a) Show with the aid of a diagram how a host and server will release a TCP connection even if the host sent ACK packet is lost after receiving the server DR packet.

(5 marks)

(b) Discuss the Silly Window phenomenon in TCP with regard to TCP windowing. How does TCP prevent the silly window from happening?

(6 marks)

(c) What is the purpose of DNS in communications networks? Describe using a diagram the steps involved in recursive DNS.

(7 marks)

(d) Explain using a graph the working of TCP Reno. How is TCP Reno different from TCP Tahoe?

(7 marks)

Total (25 marks)