**Beijing-Dublin International College**

**University College Dublin - Beijing University of Technology**

# COMPUTER NETWORKS

## Module code: COMP2001J

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**THIS PAPER CONSISTS OF FIVE QUESTIONS**
**FOUR QUESTIONS TO BE ATTEMPTED**
**ALL QUESTIONS CARRY EQUAL MARKS**

**QUESTION 1**

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

**(5 marks)**

(a) What is the purpose of ARP in computer networks? Describe the mechanics used in the ARP process.

**(6 marks)**

(b) In computer networks what is the purpose of Multiplexing? Describe with the help of a diagram the following multiplexing techniques:

i. TDM
ii. FDM

**(7 marks)**

(c) Consider an optical fibre 3000 km long with a transmitter transmitting at 1.5 Gbps (1 Gbps = 1 000 000 000 bps). The signal propagation speed in optical fibre is approximately 200000 km/sec. Suppose packet switching is being used with a packet length of 2000 bits. How many packets have been transmitted and are propagating over the fibre when the first bit reaches the destination?

**(7 marks)**

**Total (25 marks)**

**QUESTION 2**

(a) Describe 3 medium used for information transfer. Discuss how information is sent using each medium.

**(5 marks)**

(b) Describe how each of the following issues occurs in a communications network and the effect it can have on the data.

i. Near End Crosstalk
ii. Inter Symbol Interference

**(6 marks)**

(c) Explain what is meant by the term baseband modulation in network computer networks. Describe using a diagram the use of Manchester Encoding.

**(7 marks)**

(d) Suppose a communications channel uses a spectrum between 10MHz and 12MHz for communications and has an intended capacity of 8Mbps:

i. Use Shannon's theorem to find the required SNR to obtain this capacity.
ii. Use the Nyquist theorem to find the number of signalling levels required to achieve this capacity.

**(7 marks)**

**Total (25 marks)**

**QUESTION 3**

(a) With the use of an example, explain how *bit pattern flags* can be used for *framing*. What is the main drawback of using bit pattern framing and how can it be avoided?

**(5 marks)**

(b) Using the Generator Polynomial G: 110, generate the CRC for the Data M: 1110101 and construct the transmitted bits to be sent.

**(6 marks)**

(c) Describe the CSMA-CD method of medium access. Discuss the reason why there is a minimum frame length specified for CSMA-CD systems.

**(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) Distinguish between the logical and physical addressing of network interfaces.

**(5 marks)**

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

**(6 marks)**

(c) Use Djikstra's algorithm to work out the path for B for the following Link State Database. Show which links are included to the path for each step.

Link State Database:

| A | |
|---|---|
| B | 6 |
| D | 2 |

| B | |
|---|---|
| A | 6 |
| C | 2 |
| E | 1 |

| C | |
|---|---|
| B | 2 |
| F | 2 |
| G | 5 |

| D | |
|---|---|
| A | 2 |
| E | 2 |

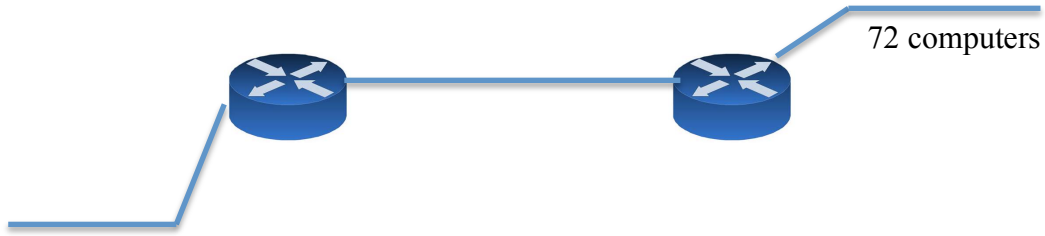
| E | |
|---|---|
| B | 1 |
| D | 2 |
| F | 4 |

| F | |
|---|---|
| C | 2 |
| E | 4 |
| G | 1 |

| G | |
|---|---|
| C | 5 |
| F | 1 |

**(7 marks)**

(d) You are given an IP range of 192.168.0.0/16. Design the IP ranges required to facilitate the network 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) Explain the purpose of using port addressing in the transport layer of the TCP/IP model.

**(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 does this reduce the number of packets lost in the network due to congestion?

**(7 marks)**

**Total (25 marks)**