



**FACULTY OF MANAGEMENT  
DECEMBER 2014 SUPPLEMENTARY EXAMINATION  
MEMORANDUM**

DEPARTMENT OF APPLIED INFORMATION SYSTEMS

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**MODULE** : COMMUNICATION NETWORKS 2B

**CODE** : CMN22B2/CMN02B1

**DATE** : DECEMBER 2014

**DURATION** : 2 HOURS

**TIME** :

**TOTAL MARKS** : 100

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**NUMBER OF PAGES** : 6 PAGES

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**INSTRUCTIONS TO CANDIDATES:**

- Read the questions carefully
- Answer all questions
- Number your answers clearly
- Write neatly and legibly
- Structure your answers by using appropriate headings and sub-headings
- The general University of Johannesburg policies, procedures and rules pertaining to written assessments apply to this assessment.

## QUESTION ONE

**1.1.** Discuss the concept of Address Resolution Protocol (ARP) and describe the four cases or situations where ARP is used [5]

**ARP-** is a network layer protocol used to convert an IP address into a physical address such as an ethernet address. The four cases are:

When two hosts are on the same network and one desires to send a packet to the other

- When two hosts are on different networks and must use a gateway/router to reach the other host
- When a router needs to forward a packet for one host through another router
- When a router needs to forward a packet from one host to the destination host on the same network

**1.2.** In a typical Network setup, Host A knows the IP address of Host B, but not the MAC address. Explain how Host A gets to know the MAC address of Host B for it to be able to send data frames. [5]

**ARP- Address Resolution Protocol**

-If Host A plans to send Host B, it knows IP address but not MAC address and without MAC address it can't make a frame

- So host A sends out a special frame, addressed to a special MAC address called "broadcast address"
- This MAC address is all 1's and all Hosts on network receive and process
- ARP REQUEST – When frame ask every host on the local network for the MAC address
- If one of the devices receiving this packet is owner of MAC address, it sends back ARP reply
- Once Host A get the MAC information it stores this in a cache
- ARP acts as a resolver

**1.3.** Data collision can be avoided in an Ethernet segment by the use of CSMA/CD. Explain how CSMA/CD avoids data collision in a bus topology [10]

- ◆ a Device/station wishing to transmit has to first listen to the channel for a predetermined amount of time so as to check for any activity on the channel.
- ◆ If the channel is sensed "idle" then the station is permitted to transmit. If the channel is sensed as "busy" the station has to defer its transmission.
- ◆ Once the channel is clear, a station sends a signal telling all other stations not to transmit, and then sends its packet.
- ◆ The station continues to wait for a time, and checks to see if the channel is still free.
- ◆ If it is free, the station transmits, and waits for an acknowledgment signal that the packet was received.

## QUESTION TWO

**2.1.** What is meant by the term Efficiency? State and describe four factor used to measure Efficiency [5]

- Efficiency means using the smallest amount of resources to accomplish the desired result

-Jitter-variation in latency

-throughput

-latency

-dropped packets

2.2. Explain the term "Congestion". Describe how the RED technique handles congestion [5]

- Congestion is when a Network has a problem when it cannot support actual traffic flow
- Random Early Detection (RED) is method for handling congestion. Its used on the router with bottlenecks
- RED- when load rises above a certain predetermined threshold the router begins to drop the few packets randomly in an attempt to coax the applications into backing off slightly
- RED tries to avoid congestion before it becomes critical
- RED drops packets before the link is 100% congested

2.3. What is a router? Discuss four (4) disadvantages of a router [5]

**Router- a device that determines the proper path for data to travel between different Networks and forwards data packets to the next device along this path**

- ◆ Every packet passing through has to be examined in much more detail than the same packet passing through a switch
- ◆ Layer 2 MAC addresses and framing have to be rewritten for every packet
- ◆ Latency through a router is higher than through a switch
- ◆ The more routers in network the more difficult

2.4. Describe how a collapsed bone network is formed? Discuss three disadvantages of a collapsed backbone network. [5]

- ◆ **Collapsed Backbone – when you connect several Ethernet segments or Token rings via a single switch**
- ◆ It interconnects various segments and collects traffic from smaller segments
- ◆ Works well in Peer to Peer networks where there is no central computer room
- ◆ Disadvantage is that all network segments must share the bandwidth of the backbone for all traffic crossing it
- ◆ Collapsed backbone architecture typically uses more cabling over longer distances
- ◆ A failure in the central switch will cause the whole network to go offline.

### QUESTION THREE

3.1. Discuss the concept of Network Address Translation (NAT) and describe the benefits it offers [10]

**Network Address Translation- a process whereby a NAT program running on a system or router translates a system's IP address into a different IP address before it sends out to a larger network. The benefits of this are:**

- lessens the need for additional globally routable address space for internal hosts
- easy renumbering when you change ISP

- Fewer internal hosts are visible to the outside world
- TCP loadbalancing

**3.2.** Internet Control Message Protocol (ICMP), just like UDP, is a connectionless protocol that determine connectivity between two host. Discuss the differences that exist between UDP and TCP [10]

#### **User Datagram Protocol (UDP)**

It is part of the base protocols of the Internet Protocol Suite. Programs on networked computers can send short messages sometimes called as datagrams. UDP does not guarantee any reliability( it happens datagram may arrive out of order, are duplicated, or are missing without any notice). The fact that no checking whether all packets are actually delivered is made, UDP proves to be faster and more efficient, for applications that do not need guaranteed delivery. UDP find its uses in such situations:

Time-sensitive applications. The problems due to delayed packets are avoided

It is also useful for servers that answer small queries from huge numbers of clients. UDP supports packet broadcast (conveys to all on local network) and multicasting (conveys to all subscribers).

#### **Transmission Control Protocol (TCP)**

It is often referred to as TCP/IP due to the importance of this protocol in the Internet Protocol Suite. TCP operates at a higher level, concerned only with the two end systems, (e.g. between web browser and a web server). TCP provides reliable, sequential delivery of a stream of data from one program on one computer to another program on another computer. Common uses of TCP regroup e-mailing support and file transfer and Web applications. Among its management tasks, TCP controls message size, the rate at which messages are exchanged, and network traffic congestion. As for IP, it handles lower-level transmissions from computer to computer as a message transferred across the Internet.

### **QUESTION FOUR**

**4.1.** Discuss five (5) disadvantages of the Routing Information Protocol (RIP) [5]

- ***RIP has no knowledge of subnet addressing***
- ***RIP routers do not respond rapidly to changes and tend to flood the network with information as they upgrade***
- ***It takes a long time to stabilize after a router or link failure.***
- ***Uses more broadcasting than OSPF (Open Shortest Path First) requiring more network bandwidth***
- ***Slowly being replaced by OSPF***

**4.2.** Discuss five (5) design goals of the Interior Gateway Routing Protocol (IGRP) [5]

- ***The IGRP protocol allows a number of gateways to coordinate their routing. Its goals are the following:***

- ***Stable routing even in very large or complex networks. No routing loops should occur, even as transients.***
- ***Fast response to changes in network topology.***
- ***Low overhead. That is, IGRP itself should not use more bandwidth than what is actually needed for its task.***
- ***Splitting traffic among several parallel routes when they are of roughly equal desirability.***
- ***Taking into account error rates and level of traffic on different paths.***

**4.3.** Discuss the differences between dynamic routing and static routing [5]

- ***Dynamic routing performs the same function as static routing except it is more robust.***
- ***Static routing allows routing tables in specific routers to be set up in a static manner so network routes for packets are set.***
- ***If a router on the route goes down the destination may become unreachable.***
- ***Dynamic routing allows routing tables in routers to change as the possible routes change.***
- ***Dynamic routing protocols do not change how routing is done. They just allow for dynamic altering of routing tables***

**4.4.** . Explain the term 'Redundancy' in network terms. Discuss three benefits of redundancy

[5]

#### **Duplication of key network devices**

- ***Its important way of improving reliability in a network, particularly against failures***
- ***At any place you implement redundancy in a network it drastically improves the stability for that component and increases Performance in terms of bandwidth.***
- ***Supports load balancing is a technique (usually performed by load balancers) to spread work between many computers, processes, hard disks or other resources in order to get optimal resource utilization and decrease computing time.***

### **QUESTION FIVE**

**5.1.** Discuss the reasons why ring topology is harder to install than bus topology [5]

**A bus topology is a linear network topology where there is a startpoint and endpoint (two different nodes) and the other nodes are between, in a straight line. A ring operates like a circle- data travels in one direction through the nodes, ending up at the starting node. In a ring topology, there is a central node to which all other nodes connects to. This is usually a hub or server.**

**5.2.** Describe the benefits offered by Virtual Local Area Networks (VLANs) not found in typical Local Area Networks [5]

**-Performance enhancements-** since broadcast frames are targeted and processed by all devices, creating smaller domains can reduce overhead and limit resource utilization.

**-Workgroups-** a VLAN can be created to accommodate groups of users who will be communicating among themselves at high volume, reducing the impact on all other workstations.

**-Ease of administration-** much of the cost associated with network additions and relocations can be saved through the use of VLANs.

**-information security-** VLANs can be used to create secure user groups and prevent others outside of the broadcast domain from receiving sensitive data

**-Broadcast Control-** VLANs reduce broadcast traffic as each broadcast will be sent on to the relevant VLAN only.

**5.3.** Discuss the benefits of having a dedicated IP as opposed to a shared IP address when getting a broadband connection [5]

**-Less downtime**

**-Anonymous access**

**-Remote access**

**-Running an FTP Server**

**-Having your own Private SSL Certificate**

**5.4.** Discuss the differences that exist between Dynamic IP addressing and Static IP addressing highlighting the benefits and drawbacks of each [5]

**Static IP addressing-** one customer on one IP address and Dynamic IP addressing assigns a different IP address each time the ISP customer logs on to their computer.

**Static-** reliable for VOIP, VPN, offers faster file uploads and downloads, IP not shared with another company.

**Drawbacks-** less cost effective than dynamic IP addresses, can become a security risk because the address is always the same. Static IP addresses are easier to track for data mining companies.

**Dynamic IP addressing-** less security risks

**-cost effective**

**-there is automatic network configuration**

**Drawbacks**

**-cannot be used for VOIP**

**-less reliable than static IP addressing**