

**CONFIDENTIAL**



**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

**FINAL EXAMINATION  
SEMESTER II  
SESSION 2014/2015**

**COURSE NAME : NETWORK DESIGN**  
**COURSE CODE : BIT 33003**  
**PROGRAMME : 3 BIT**  
**EXAMINATION DATE : JUNE 2015 /JULY 2015**  
**DURATION : 3 HOURS**  
**INSTRUCTION : ANSWER ALL QUESTIONS**

**THIS QUESTION PAPER CONSISTS OF SIX (6) PAGES**

**CONFIDENTIAL**

- Q1** (a) In addition to analyzing business goals and determining your customer's need to support new and existing applications, it is important to analyze any business constraints that will affect your network design.

Discuss the following constraints:

- (i) Politics and policies
- (ii) Budgetary and Staffing Constraints

(6 marks)

- (b) A network design customer has a goal of 97.90 percent uptime.

- (i) Calculate how much downtime will be permitted in hours per week.

(3 marks)

- (ii) Calculate how much downtime will be permitted in minutes per day and seconds per hour.

(3 marks)

- (iii) Determine which values are acceptable in which circumstances.

(2 marks)

- (c) A packet switch has five users, each offering packets at a rate of 20 pps. The average length of the packets is 1024 bits. The packet switch needs to transmit this data over a 84 kbps WAN circuit.

- (i) Calculate Network Load, Utilization and the Average number of packets in the Queue (Queue Depth).

(6 marks)

- (ii) Do you recommend the company to upgrade its line or not? If yes, calculate the recommended bandwidth capacity. If not, provide reasoning to your recommendation.

(2 marks)

(d) Consider the following scenario:

UTHM has installed a web application called SACAD for its students. After sampling the response times for the SMAP Web application, it was averaged at 150 ms.

(i) Is this response time reasonably good?

(1 marks)

(ii) State the reason for Q1(d)(i).

(2 marks)

**Q2** (a) Consider the following scenario:

Sabrina's Fruit and Chocolate Company was established in 1935 in the Pacific Northwest of the United States to ship gift baskets of locally grown peaches and pears to customers in the United States. The company also makes chocolates and baked goods to include in the gift baskets. It has grown extensively over the years and is currently one of the biggest companies in the Pacific Northwest.

Recently, Sabrina's descendants, who still run the company, have identified a need to immediately report when fruit is starting to ripen and should be picked and placed in cold storage. Employees in the marketing department have identified a need to access inventory data for the fruit in the orchards and in cold storage. With this data, they can design and sell gift-basket products that take advantage of the ripe fruit. This data must also be fed into e-commerce applications so that web orders can correctly specify product availability.

In addition, the company recently hired an ambitious programmer who is anxious to use her knowledge of SAS programming, SQL, and DB2 to design reporting applications for senior management. She calls you every day with new ideas on what she could accomplish if the network were upgraded so that she could reach up-to-date data from the orchards and cold storage buildings.

As the network designer for this company, you have been charged with selecting network technologies to reach the orchards and cold storage buildings. Each of the six orchards has a shack with one or two standalone PCs and a printer. The three cold storage buildings are huge warehouses that include a few standalone PCs and printers. The local telephone company has suggested that you lease fractional T1 links, but these links are expensive and

possibly beyond your budget. Wireless technologies are also possible, but you have heard that fruit trees, especially full-grown trees that are tall and leafy, can absorb a wireless radio frequency (RF) signal. You have also heard that the cold storage buildings have ice hazards, making it hard to install equipment.

- (i) Determine **TWO (2)** major user communities. (4 marks)
  - (ii) Determine **THREE (3)** major data stores and the user communities for each data store. (6 marks)
  - (iii) Characterize the network traffic in terms of flow, load, behavior and QoS requirement. (*Hint: Use a table*) (9 marks)
- (b) Using suitable diagram, demonstrate how a **routing loop** occur. (6 marks)

**Q3** Consider the following scenario:

The city of Kinrara, Selangor, which owns and operates its own power utility, built a fiber-optic network to monitor power meters at residents' homes. The network is called Kinrara Fiber Network (KFN). Because KFN had more capacity than was needed to monitor meters, the city expanded its services to offer access to the network for city businesses. The businesses use the network to communicate with each other and to access the Internet. At the KFN head end, which is located with the city government offices, a single router and highspeed WAN links connect to the Internet for use by the city. The businesses on KFN also use this router to reach the Internet. In addition to the business service, KFN also offers cable modem service to homes. A cable modem router at the KFN head end connects to the fiber-optic network. In the city neighborhoods, hybrid fiber-coax nodes bring coax cabling to each street and into the homes for cable modem Internet access. The KFN backbone consists of a fiber-optic Gigabit Ethernet network that runs through the city in a ring topology. The fiber-optic ring connects the hybrid fiber-coax nodes that bring coax cabling to each neighborhood. Also connected to the ring are six data routers. Each router links one or more Kinrara businesses to KFN via simple point-to-point connections. At the business, the fiber-optic network enters the building and connects to a media (Fiber to UTP) converter. A UTP cable connects to the media converter and typically to a 100-Mbps Ethernet switch. The switch links the business's computers and servers in a star topology via UTP cabling.

- (a) Draw a network map that shows the topology of the Kinrara (show how the main components are connected).  
(9 marks)
- (b) Suggest **TWO (2)** possible multihoming options that can be applied to Kinrara Fiber Network to improve the availability of its Internet connection.  
(6 marks)
- (c) Kinrara is considering expanding the KFN to include wireless access for its residences. Suggest additional investigation that can be done to prepare a citywide wireless network.  
(5 marks)
- (d) Evaluate possible security concerns for the proposed citywide *wireless network*.  
(5 marks)



- Q4** (a) Provide **TWO (2)** examples for each of the following:
- (i) security policy (2 marks)
  - (ii) security mechanisms (2 marks)
- (b) Selecting internetworking devices for a campus network design is part of the physical design phase. Compare:
- (i) Hub vs Switch
  - (ii) Bridge vs Switch
  - (iii) Router vs Gateway (9 marks)
- (c) Jauhjauh Sdn Bhd is a big corporate with 15 branches accessing its corporate server farm located at its headquarters in Parit Raja.
- Propose the best WAN topology for Jauhjauh to link the headquarters to all its branches. (6 marks)
- (d) Huha Sdn Bhd is a small company with 50 employees is running its own web server for marketing purposes.
- Propose a suitable firewall topology for Huha. (6 marks)

**-END OF QUESTION-**

