



[Any examinee found adopting unfair means will be expelled from the trimester/program as per UIU disciplinary rules.]

PART - A

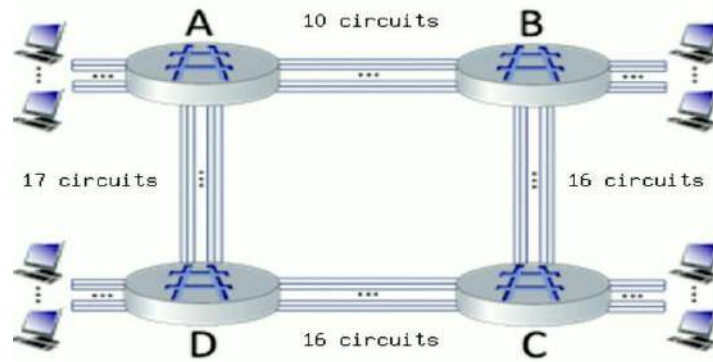
There are **Three (03)** questions. Answer **any 02 questions**. All questions are of values indicated on the right-hand margin.

Q1.

- a) With the aid of diagrams, compare the OSI and TCP/IP layered models. Diagrams should show all the layers' functions and an example of TCP/IP protocol suite for each layer. [3]
- b) For the **TCP/IP layered architecture**, answer the following questions: [3]
- i. What are the port numbers of HTTP and SMTP?
 - ii. How can you classify the transport-layer protocol that can be offered to applications? Which one will you use in case of online gaming?
 - iii. How do you differentiate between IPv4 and IPv6?
 - iv. Every entity in a TCP/IP system requires two level of addressing. What are they?
 - v. At which Layer do CRC and Checksum work?
 - vi. How do you connect end systems to edge router?
- c) What are the **two technologies** used in the **Network Core**? Describe each one with proper **example, advantages** and **disadvantages**. [3]

Q2.

- a) **How long** does it take a packet of length **2,500 bytes** to **propagate** over a link of distance **1,000 km**, propagation speed **2.5×10^8 m/s**, and transmission rate **1.5 Mbps**? Does this delay depend on **packet length**? Does this delay depend on **transmission rate**? [3]
- b) Suppose a host wants to send 3 Kb packet onto an optical fiber link of distance **1,500 km** with transmission rate **2 Mbps**. What would be the total nodal delay? [3]
- c) Consider the circuit-switched network shown in the figure below, with circuit switches A, B, C, and D. Suppose there are 10 circuits between A and B, 16 circuits between B and C, 16 circuits between C and D, and 17 circuits between D and A. [3]

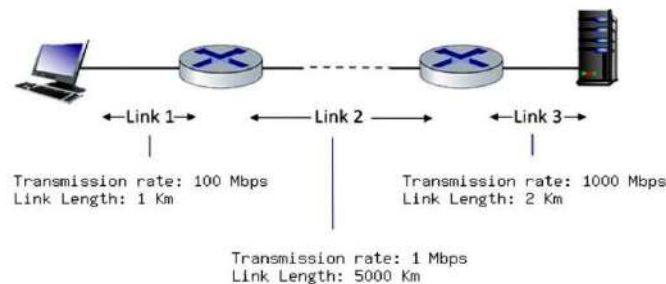


Very briefly answer the followings:

- What is the maximum number of connections that can be ongoing in the network at any one time?
- Suppose that all the circuits (maximum number of connections) are ongoing and occupied. What happens when another call connection request arrives at the network, will it be accepted or dropped?
- What happens to the capacity of a circuit segment if it is not occupied by a call?

Q3.

- a) Consider the figure below, with three links, each with the specified transmission rate and link length. Assume the length of a packet is 16000 bits. The speed of light propagation delay on each link is 3×10^8 m/sec. You can assume the processing and queueing delays are negligible in links 1 and 3, but there is a combined processing and queueing delay of 0.005s in link 2. Calculate the total delay from the PC to the server.
- [3]

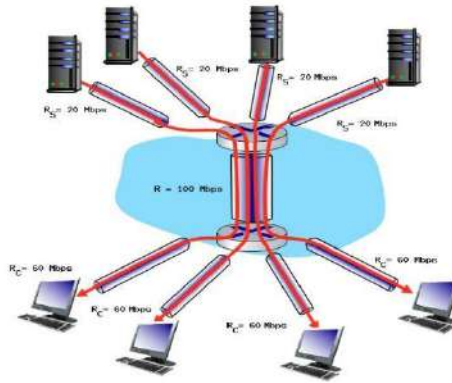


- b) Define bottleneck link in terms of end-to-end throughput. Consider the scenario below where we have four different servers (R_s) connected to four different clients (R_c) over four three-hop paths. The four pairs share a common middle hop/link with a transmission capacity of $R = 100$ Mbps. The four links from the servers to the shared link have a transmission capacity of $R_s = 20$ Mbps. Each of the four links from the shared middle link (R) to a client has a transmission capacity of $R_c = 60$ Mbps.

[3]

Now answer the followings:

- Which link is the bottleneck link? Format as R_c , R_s , or R ?
- What is the maximum achievable end-end throughput (in Mbps) for each of four client-to-server pairs (R_c-R_s), assuming that the middle link (R) is shared by the four pairs?



- c) In two sentences define the main function of routing and forwarding. In which part of the network these two occur? Which type of service is preferred for Domain Name System (DNS), TCP or UDP? Why?

[3]

PART - B

There are **Three (03)** questions. Answer **any 02 questions**. All questions are of values indicated on the right-hand margin.

Q4.

- a) Assume that you have a base HTML file with 10 embedded images (jpeg), and 5 videos (mp4). Assume that all 15 objects (images & videos), and the base file are small enough to fit in one TCP segment. How many RTTs are required to retrieve base files & images under the following condition: [3]
- Non-Persistent connection without parallel connection
 - Non-persistent connection with five parallel connections
 - Persistent connection with pipe-lining
- b) Suppose that a Web server and an FTP server run on port number 80 and 21 respectively in Host C. This Host C is currently receiving requests from two different Hosts, A and B. Browsers of Hosts A are running on port number 5555, and from Host B requests for FTP service are coming from port number 6666. With the help of a diagram explain how does Host C directs segments to the appropriate socket? What tuples (Ip: port) are being used here?

[3]

Q5.

- a) Suppose that a student (host: lab14.uiu.ac.bd) from the computer lab of UIU is browsing the site scholar.google.com and he is the first person to browse this site from the UIU network. Illustrate with a diagram how the required IP address mapping will be resolved in case of an iterative query. You may have to assume the names of different name servers. Draw the diagram and briefly explain how it works. Also, answer what drawbacks you could face if you had used a recursive query. [4]
- b) What is the main objective of a conditional GET message? [2]



Q.2.

- a) Calculate the Checksum for the following three 16-bit words: [3]
1100 0110 1100 1100
1100 1100 1001 1011
1001 0010 1000 0111
- b) Differentiate between TCP and UDP in terms of flow and congestion control. [2]
]
- c) Why do we need web caching? [1]
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End of Paper - Thank You