Sir Syed University of Engineering & Technology
Faculty of Computing & Applied Sciences
Department of _Computer Science & Information Technology_

Online End Semester Examinations (Spring 2021)

Course Code with Title	CS-328: Data Communication and Networks		Program	BS (CS)
Instructor	**Waleej Haider, Razia Nisar Noorani & Sana Ejaz**		**Semester**	5th
Start date & Time	June 17, 2021 at 11:30 AM	**Submission Deadline**	June 17, 2021 at 4:30 PM	
Maximum Marks	50			
Students must meet their submission deadline as there is no re-take or re-attempt after the deadline.				

IMPORTANT INSTRUCTIONS:

Read the following Instructions carefully:

- All Questions carries equal marks
- Attempt All Questions on MS-Word. Font theme and size must be Times New Roman and 12 points respectively. Use line spacing 1.5.
- You may provide answers HANDWRITTEN. The scanned solution must be submitted in PDF file format (Use any suitable Mobile Application for Scanning)
- For Diagrams, you can use paper and share a clear visible snapshot in the same Answer Sheet.
- Arrange questions and their subsequent parts in sequence.
- Make sure that your answers are not plagiarized or copied from any other sources. In case of plagiarism, **ZERO** marks will be awarded.
- Provide relevant, original and conceptual answers, as this exam aims to test your ability to examine, explain, modify or develop concepts discussed during the course.
- Recheck your answer before the submission on **VLE** to correct any content or language related errors.
- You must upload your answers via the VLE platform ONLY.

You must follow general guideline for students before online examination and during online examination which had already shared by email and WhatsApp.

This paper has a total of _04_ pages including this title page

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NOTE: Similarity in the answers will be considered as cheating and this act will results in cancellation of both papers.

Use the following values to solve your questions:
X= your roll #   **Y=** Sum of your roll # (if your roll # = 412, **Y**=4+1+2=7)
Z= Last two digits of roll # (if roll # is 412, **Z**=12)
A= Sum of last two digits of roll # (use 5 in place of zero. If your roll # is 02, use 5+2=7)

Q.1.   (5+5)

a. Calculate the time of sending a file of **X** x 1000 bits from host A to host B over a circuit-switched network where:
   i)   All links are = last digit of your roll # in Mbps (use 9 if last digit of your roll # is zero)
   ii)   Each link uses TDM with **Z** slots/sec
   iii) A link is established after sending 3 request. Each request to establish end-to-end circuit consumed **Y** x 100 msec.

b. Assume a telephone channel with a bandwidth of **Y**x1000 Hz and a signal to noise ratio of **Z** dB. Calculate the capacity of the channel. Further, if we double the value of signal to noise ratio, what will be the impact on the channel capacity.

Q.2.   (10)

In 3rd wave of COVID-19, an integrated system is needed to be designed for providing services to various users, patients, doctors, and hospitals. Some of the features of this system are:

   i)   A patients can reserve a time slot for COVID-19 detection and other related tests using web-based platform.
   ii)   People can get reports online using their accounts.
   iii) All the medical centers have their servers connected to a country-wide server.
   iv)   Country-wide server collects information from medical centers regarding tests, positive cases, recovery and death ratio, vaccination and its impact etc.
   v)   This information is shared with World Health Organization (WHO) using this system.
   vi)   WHO provides technical guidance, answer to the queries of people and current research about COVID-19.

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In light of the above scenario, design a network of this system and associate appropriate protocols (HTTP, FTP, SMTP, POP, SCTP, ARP, DNS, TCP, UDP, TCP/IP), cookies and web cache with various parts of this system and discuss the role of protocols and other entities (cookies, web cache) in the systems.

Q.3.   (10)

Consider **Z** as hexadecimal and convert both elements into binary values. Draw signals using Return to zero (RZ), Pseudoternary and Manchester schemes. For Example: if **Z**=12 then 00010010 will be used to generate waveforms. Used 9 in place of 0. (If Z= 03, use 9 3).
In your opinion, which scheme can be used for recording on a magnetic tape? Is it necessary to convert the data into signals before transmission? Why or why not, justify.

	0	0	0	1	0	0	1	0
Zero (RZ)								
Pseudoternary								
Manchester								

Q.4.   (10)

Suppose two neighboring nodes (Ali and Bilal) want to transmit frames using **M**-bit sequence number in a sliding-window protocol.
Assume window size of **N** in the ARQ mechanism. Ali is transmitting the frames to Bilal. Using the values of **M** and **N**, show the window positions for the following events of data exchange:
  i.   Design a window before Ali sends any number of frames
  ii.   After Ali sends frames =**N** and receives acknowledgment from Bilal for first two frames.
  iii. If Ali sends frames 3, 4, 5 and 6 and Bilal sends acknowledgement of frame 5 to Ali but the acknowledgement of frame 5 is damaged or lost. What the protocol will do in this situation.
Where **N**= number of characters in your first name and **M**= number of character in your second name.
Suppose multiple frames are being sent on a link with data rate **R**= **Y** x 1000 bps. The length or distance **d** of the link is **X** x 100 meters. Here, velocity of the propagation is **Z** m/s. Calculate the bit length of the channel.

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Q.5.   (10)

Design a similar network shown in Figure 1 with **A** nodes and assign link costs or distance vector values using the digits from your complete roll # (i.e. 2019-CS-412) and name of the nodes using characters of your name. Assume each node is sharing information with its neighbor nodes. Select a suitable routing algorithm to:

   i)   Compute shortest path by selecting 2 nodes of your own choice. Or
   ii)   Show the distance table entries at any 2 nodes
   iii)   What will be the impact on routing performance of the network if we double the cost of the links or distance vector values?
   iv)   Explain step-by-step process of routing in the designed network.
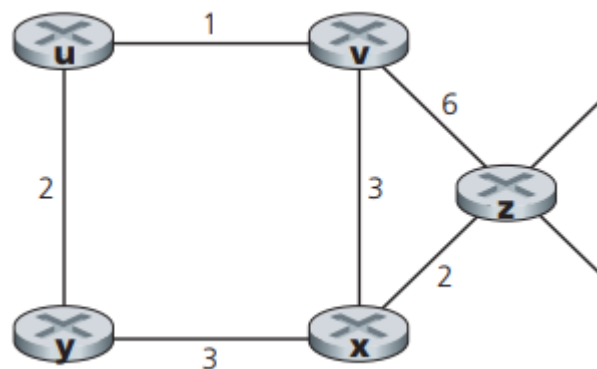

Figure 1