Sir Syed University of Engineering & Technology
Faculty of Basic & Applied Sciences
Department of <u>Computer Science</u>

End Semester Examinations (Spring 2020)

Course Title with Code	**CS-328: Data Communication and Networks**		**Program**	BSCS
Instructors	**Razia Nisar Noorani, Waleej Haider**		**Semester**	5th
Start date & Time	July 2, 2020 at 11:30 AM	**Submission Deadline**	July 2, 2020 at 05:30PM	
Maximum Marks	50			

<u>IMPORTANT INSTRUCTIONS</u>:

Read the following Instructions carefully:

- Attempt All Questions on MS-Word. Font theme and size must be Times New Roman and 12 points respectively. Use line spacing 1.5. Convert file to PDF format before submitting.
- 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.

<u>**You must follow general guideline for students before online examination and during online examination which had already been shared by email and WhatsApp.**</u>

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Q.1. (10)

Various companies (like Uber, Careem, etc) have been offering services that include peer-to-peer ridesharing, ride service hailing and food delivery in the big cities of Pakistan. Every vehicle has unique ID, they claim security of passengers and things to be delivered. Almost everything in the structure of these vehicle networks are same as computer networks.
Assuming both networks, discuss the following using your own concepts.

a. How all the stages of services utilization on these vehicle networks can be mapped to the OSI layers? For **example**, we can compare application layer of vehicle network based on following services: i) application based services to access the network, ii) user authentication and privacy of OSI application layer. Map other six layers of both networks.

b. Compare these vehicular networks with computer network on the basis of (i) data packets, ii) headers, iii) addressing, iv) routing, v) switching, vi) congestion control, vii) delays, and viii) packet loss. How the statistical multiplexing on the vehicular network could be used to fill un-booked free seats or missing rides by users. Write 2-3 lines for each comparison.

Q.2. (5+5)

Solve the following:
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a. What is the maximum data rate of a channel with a bandwidth BW equal to "sum of digits of your roll number * 200 KHz" if we use four levels of digital signaling? (If your roll# is 290 then BW is equal to 2+9+0= 11*200KHz)

b. An analog signal has a bandwidth equal to "sum of digits of your roll number * 200 KHz". If we sample this signal and send it through an X*10 Kbps channel what is the SNRdB? (Where X is your birth month, for example if your birth month is March then the channel capacity will be 3x10 Kbps).

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Q.3.   **(10)**

Consider last two digits of your roll # as hexadecimal values. Convert your roll # into binary digits, create a table and place a stream of binary data as described in Table 1. Draw the waveform for this sequence using Bipolar-AMI, Manchester and Differential Manchester schemes.

For Example: If your roll # is **258**. You will select **5 8** as a hexadecimal and will convert into binary as **01011000.** If an element of your roll # is **zero**, then select **9** in place of zero as: If my roll number is **250**, then I will select **5 9** instead of **5 0**. Similarly if my roll # is **102**, I will use **9 2 in place of 0 2**.

Table 1: Example to be followed

	0	1	0	1	1	0	0	0
Bipolar-AMI								
NRZ-I								
Manchester								
Differential Manchester								

Q.4.   **(10)**

In a Peer- to peer network, files rapidly share among nodes/peers. Each node has the capability to get chunks of the same file from various nearest neighbors (nodes). While increasing seeds and leechers, the network starts fast exchange of file sharing among peers (e.g. torrent). In COVID-19, spreading virus is similar to the chunks exchange in the peer to peer networks.

Compare and contrast both networks based on i) peer generation, ii) speed of data sharing, iii) network architecture and iv) seeds/leechers. Explain complete procedure with your own logic, how can you help the authorities to minimize or stop spreading of CORONA virus among people using the concept of peer to peer networks?

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Q.5.   (10)

Considering Automatic Repeat Request, suppose two neighboring nodes (Ali and Bilal) use a sliding-window protocol with X-bit sequence number. Using go-back-N with a window size of Y in the ARQ mechanism, Ali is a transmitting and Bilal is a receiving node. Use the values of X and Y to show the window positions for the following events of data exchange:

     i.   Create window before Ali sends any number of frames
    ii.   Show the window after Ali sends frames =X and receives acknowledgment from Bilal for only first two frames.
   iii.   After Ali sends frames 3, 4, 5 and 6 and Bilal sends acknowledgement of frame 5 to Ali.

Where **X**= number of characters in your first name and **Y**= number of character in your second name.