| Register Number | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

**SRM Institute of Science and Technology**
**College of Engineering and Technology**
**School of Computing**

SRM Nagar, Kattankulathur – 603203, Chengalpattu District, Tamil Nadu

Set - A

**Academic Year: 2021-22 (Even)**

Test: CLA-T2 | Date: 30-05-2022
Course Code & Title: 18CSS202J - Computer Communications | Duration: 100 Minutes (2 Periods)
Year & Sem: II Year / IV Sem | Max. Marks: 50

**Course Articulation Matrix:**

| S.No. | Course Outcome | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | CO1 | 3 | - | - | - | - | - | - | - | - | - | - | 3 |
| 2 | CO2 | 3 | 2 | 3 | - | - | - | - | - | - | - | - | 3 |
| 3 | CO3 | 3 | 3 | 3 | - | - | - | - | - | - | - | - | 3 |
| 4 | CO4 | 3 | 2 | - | - | - | - | - | - | - | - | - | 3 |
| 5 | CO5 | 3 | - | - | - | - | - | - | - | - | - | - | 2 |
| 6 | CO6 | 3 | 3 | 3 | - | - | - | - | - | - | - | - | 3 |

**Part - A**
**(20 x 1 = 20 Marks)**

**Instructions: 1) Answer ALL questions. 2) The duration for answering the part A is 30 minutes (this sheet will be collected after 30 minutes). 3) Encircle the correct answer 4) * denotes more than one choice may be correct**

| Q. No | Question | Marks | BL | CO | PO | PI Code |
|---|---|---|---|---|---|---|
| 1 | In IPV4 address, Class A uses _____ bits for net ID and _____ bits for host ID<br>**a) 8, 24** b)16, 16 c)15, 17 d)24, 8 | 1 | 1 | 3 | 1 | 1.7.1 |
| 2 | How many possible addresses per network are there in a class C of an IPv4 address?<br>a) 65536 b) 128 **c) 256** d) 2097152 | 1 | 1 | 3 | 1 | 1.7.1 |
| 3 | Choose the binary notation of the IPv4 address 145.101.168.123<br>a) 01111011 10101000 01100101 10010001<br>b) 10010011 01100111 10101001 01111001<br>**c) 10010001 01100101 10101000 01111011**<br>d) 10010001 01100111 11101000 11111011 | 1 | 2 | 3 | 2 | 2.6.3 |
| 4 | Choose the class of the given IPV4 address 128.28.12.128<br>a) A **b) B** c) C d) D | 1 | 1 | 3 | 1 | 1.7.1 |
| 5 | Find the number of addresses in 192.168.10.26/26.<br>a) 16 b) 32 **c) 64** d)128 | 1 | 2 | 3 | 1 | 1.7.1 |
| 6 | In IPv4 datagram header there are many fields and one of the field is Time to Live -TTL. This field is used to _____<br>a) optimize throughput b) reduce delay<br>c) set priority for packets **d) prevent looping** | 1 | 2 | 3 | 1 | 1.7.1 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 7 | The block 224.0.0.0/4 has the _____.<br>**a) Multicast Addresses** b) loopback address<br>c) limited broadcast address d) first address | 1 | 2 | 3 | 1 | 1.7.1 |
| 8 * | Router operates at layer (s) ____of the OSI model.<br>**a) Physical Layer** **b) Network Layer**<br>c) Session Layer d) Presentation Layer | 1 | 2 | 3 | 1 | 1.7.1 |
| 9 | A _____ is a device in which the stations are completely unaware of its existence.<br>a) passive hub b) repeater<br>c) simple bridge **d) transparent bridge** | 1 | 1 | 3 | 1 | 1.7.1 |
| 10 | Slash Notation is also called as CIDR. CIDR stands for _____.<br>a) Classful inter-domain routing<br>b) **Classless inter-domain routing**<br>c) Classful intra-domain routing<br>d) Classless intra-domain routing | 1 | 1 | 3 | 1 | 1.7.1 |
| 11 | The Amplitude shift keying is used to convert the _____.<br>a) digital signal into analog data<br>b) analog data into digital signal<br>**c) digital data into analog signal**<br>d) analog signal into digital data | 1 | 1 | 4 | 1 | 1.7.1 |
| 12 | In _____ the signal levels are on one side of the time axis, either above or below.<br>**a) Unipolar** b) Polar c) Bipolar d) Multilevel | 1 | 1 | 4 | 1 | 1.7.1 |
| 13 | The _____ is the number of signal elements sent in 1s.<br>a) data rate **b) signal rate** c) pulse rate d) message rate | 1 | 1 | 4 | 1 | 1.7.1 |
| 14 | In Binary ASK, the peak amplitude of one signal level is _____ and the other is _____.<br>**a) 0, same as the amplitude of the carrier frequency**<br>b) same as the amplitude of the carrier frequency, 1<br>c) 1, same as the amplitude of the carrier frequency<br>d) same as the amplitude of the carrier frequency, 0 | 1 | 1 | 4 | 1 | 1.7.1 |
| 15 | Calculate the value of the signal rate for the case “One data element per one signal element” if the data rate is 1 Mbps and c = 1/2.<br>**a) 500 Kbaud** b) 1 Mbaud c) 250 Kbaud d) 375 Kbaud | 1 | 3 | 4 | 2 | 2.6.3 |
| 16 | Which multiplexing technique transmits analog signals?<br>a) TDM **b) FDM** c) CDM d) SDM | 1 | 1 | 4 | 1 | 1.7.1 |
| 17 | In _____ synchronous TDM, the data flow of each input connection is divided into units, where each input occupies one input time slot.<br>**a) Synchronous TDM** b) Synchronous FDM<br>c) Synchronous CDM d) Synchronous SDM | 1 | 1 | 4 | 1 | 1.7.1 |
| 18 | If there are n signal sources of same data rate, then the TDM link has _____ slots.<br>a) 2n b) n/2 c) n*2 **d) n** | 1 | 2 | 4 | 1 | 1.7.1 |
| 19 | The Polar Return to Zero scheme uses _____ voltage values.<br>a) 1 b) 2 **c) 3** d) 4 | 1 | 1 | 4 | 1 | 1.7.1 |
| 20 | In cable television, many television channels are carried simultaneously on a single cable - which multiplexing is used in cable television?<br>a) TDM **b) FDM** c) CDM d) Synchronous TDM | 1 | 3 | 4 | 1 | 1.7.1 |

| Register Number | | | | | | | | | | | | | | | |
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Set - A

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Year & Sem: II Year / IV Sem | Max. Marks: 50

**Part – B**
**(2 x 5 = 10 Marks)**

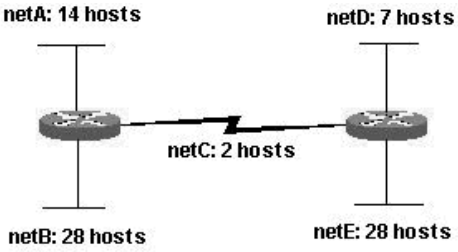
**Instructions: Answer ALL questions**

| Q. No | Question | Marks | BL | CO | PO | PI Code |
|---|---|---|---|---|---|---|
| 21 | Identify the network Id for the IP address 172.168.168.16 with subnet mask 255.255.192.0 and calculate the number of subnets and hosts that could be configured in each subnet.<br><br>**Answer:**<br>Network Id: 172.168.128.0/18<br>Number of Subnets: 4<br>Number of Hosts: 16382 | 5 | 3 | 3 | 2 | 2.6.3 |
| 22 | Define data rate and signal rate. What is the unit for data rate and signal rate? What is the impact of increasing the data rate and decreasing the signal rate?<br><br>**Answer:**<br>*Definition*<br>✓ The data rate defines the number of data elements (bits) sent in 1s.<br>✓ The signal rate is the number of signal elements sent in 1s.<br>*Unit*<br>✓ The unit for data rate is bits per second (bps).<br>✓ The unit for signal rate is the baud.<br>*Impact:*<br>✓ Increasing the data rate increases the speed of transmission; decreasing the signal rate decreases the bandwidth requirement | 5 | 2 | 4 | 1 | 1.7.1 |

**Part – C**
**(2 x 10 = 20 Marks)**

**Instructions: Answer ALL questions**

| Q. No | Question | Marks | BL | CO | PO | PI Code |
|---|---|---|---|---|---|---|
| 23. A | Given the Class C network of 204.15.5.0, subnet the network in order to create the network in the figure below, with the host requirements shown in table. | 10 | 3 | 3 | 2 | 2.6.3 |



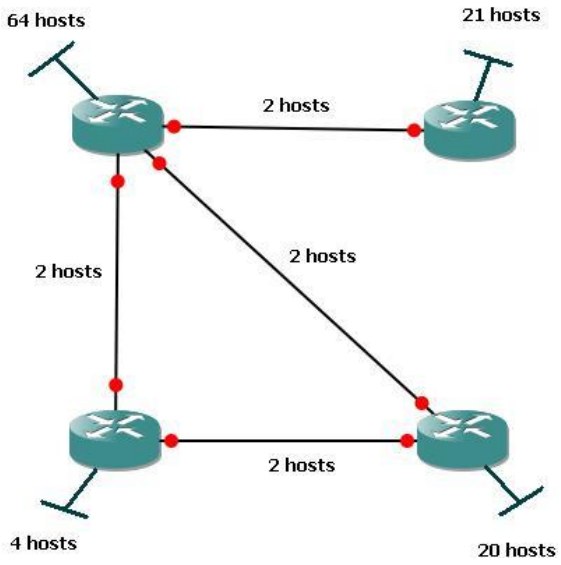

| Network | Hosts | Net ID in CIDR notation | Subnet Mask | Number of Hosts in Subnet | Broadcast Address |
|---|---|---|---|---|---|
| A | | | | | |
| B | | | | | |
| C | | | | | |
| D | | | | | |
| E | | | | | |

**Answer:**

| Network | Hosts | Net ID in CIDR notation | Subnet Mask | Number of Hosts in Subnet | Broadcast Address |
|---|---|---|---|---|---|
| B | 28 | 204.15.5.0/27 | 255.255.255.224 | 32 | 204.15.5.31 |
| E | 28 | 204.15.5.32/27 | 255.255.255.224 | 32 | 204.15.5.63 |
| A | 14 | 204.15.5.64/28 | 255.255.255.240 | 16 | 204.15.5.79 |
| D | 7 | 204.15.5.80/28 | 255.255.255.240 | 16 | 204.15.5.95 |
| C | 2 | 204.15.5.96/28 | 255.255.255.252 | 4 | 204.15.5.99 |

Or

| | | | | | | |
|---|---|---|---|---|---|---|
| 23. B | Solve the below-given scenario using VLSM for the network 192.168.10.0 and list out the addressing range of all subnets in detail. | 10 | 3 | 3 | 2 | 2.6.3 |




**Answer:**

64 Hosts:
Net id: 192.168.10.0/25
First address: 192.168.10.1
Broadcast Address: 192.168.10.127

21 Hosts:
Net id: 192.168.10.128/27
First address: 192.168.10.129
Broadcast Address: 192.168.10.159

20 Hosts:
Net id: 192.168.10.160/27
First address: 192.168.10.161
Broadcast Address: 192.168.10.191

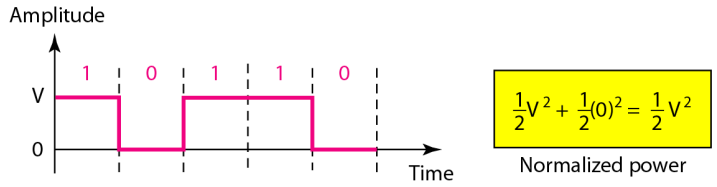
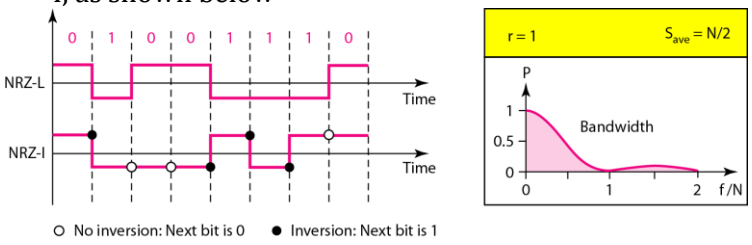
4 Hosts:
Net id: 192.168.10.192/29
First address: 192.168.10.193
Broadcast Address: 192.168.10.199

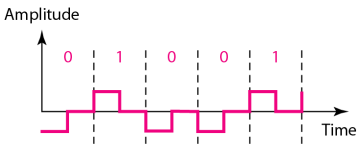
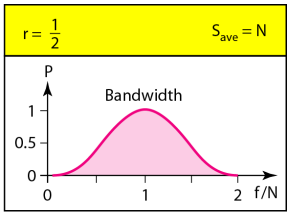
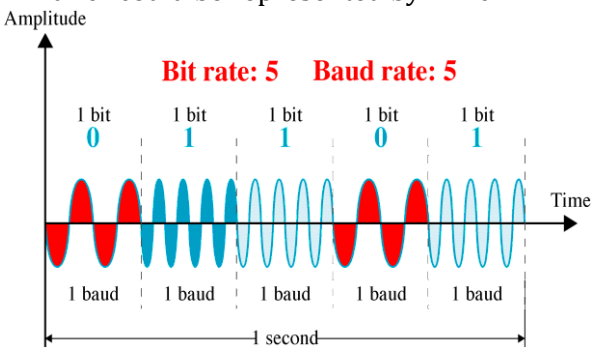
2 Hosts:
Net id: 192.168.10.200/30
First address: 192.168.10.201
Broadcast Address: 192.168.10.203

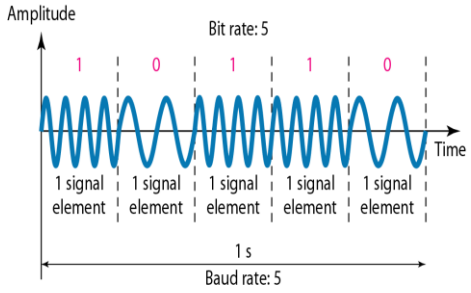
2 Hosts:
Net id: 192.168.10.204/30
First address: 192.168.10.205
Broadcast Address: 192.168.10.207

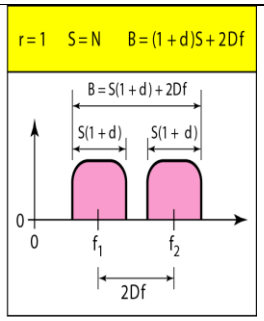
2 Hosts:
Net id: 192.168.10.208/30
First address: 192.168.10.209
Broadcast Address: 192.168.10.211

2 Hosts:
Net id: 192.168.10.212/30
First address: 192.168.10.213
Broadcast Address: 192.168.10.215

| | | | | | | |
|---|---|---|---|---|---|---|
| 24. A | Explain Unipolar NRZ, Polar NRZ and RZ encoding schemes with suitable diagram.<br>**Answer:**<br>*Unipolar Scheme*<br>✓ In a unipolar scheme, all the signal levels are on one side of the time axis, either above or below.<br>*Unipolar NRZ (Non-Return-to-Zero)*<br>✓ A unipolar scheme was designed as a non-return-to-zero (NRZ) scheme in which the positive voltage defines bit 1 and the zero voltage defines bit 0.<br>✓ It is called NRZ because the signal does not return to zero at the middle of the bit.<br>✓ Below figure show a unipolar NRZ scheme.<br>  <br>✓ the normalized power (power needed to send 1 bit per<br>✓ unit line resistance) is double that for polar NRZ.<br>✓ For this reason, this scheme is normally not used in data communications today.<br>*Polar Scheme*<br>✓ In polar schemes, the voltages are on the both sides of the time axis.<br>✓ For example, the voltage level for 0 can be positive and the voltage level for I can be negative<br>*Polar NRZ*<br>✓ In polar NRZ encoding, we use two levels of voltage amplitude.<br>✓ We can have two versions of polar NRZ: NRZ-L and NRZ-I, as shown below<br>  <br>✓ The figure also shows the value of r, the average baud rate, and the bandwidth.<br>✓ In the first variation, NRZ-L (NRZ-Level), the level of the voltage determines the value of the bit.<br>✓ In the second variation, NRZ-I (NRZ-Invert), the change or lack of change in the level of the voltage determines the value of the bit.<br>✓ If there is no change, the bit is 0; if there is a change, the bit is 1.<br>✓ In NRZ-L the level of the voltage determines the value of the bit. In NRZ-I the inversion or the lack of inversion determines the value of the bit.<br>✓ Baseline wandering is a problem for both variations<br>✓ The synchronization problem (sender and receiver clocks are not synchronized) also exists in both schemes<br>✓ Another problem with NRZ-L occurs when there is a sudden change of polarity in the system<br>*Polar Return to Zero (RZ)*<br>✓ In RZ, the signal changes not between bits but during the bit. | 10 | 2 | 4 | 1 | 1.7.1 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | ✓ In below figure, we see that the signal goes to 0 in the middle of each bit. It remains there until the beginning of the next bit<br>  <br>  <br>✓ The main disadvantage of RZ encoding is that it requires two signal changes to encode a bit and therefore occupies greater bandwidth.<br>✓ The same problem we mentioned, a sudden change of<br>✓ polarity resulting in all as interpreted as 1s and all 1s interpreted as as, still exist here, but there is no DC component problem. Another problem is the complexity: RZ uses three levels of voltage, which is more complex to create and discern.<br>✓ As a result of all these deficiencies, the scheme is not used today | | | | | |
| | Or | | | | | |
| 24. B | With an appropriate example, explain the Frequency shift keying mechanism.<br>**Answer:**<br>✓ In frequency shift keying, the frequency of the carrier signal is varied to represent data.<br>✓ The frequency of the modulated signal is constant for the duration of one signal element, but changes for the next signal element if the data element changes.<br>✓ Both peak amplitude and phase remain constant for all signal elements.<br>✓ The digital data stream changes the frequency of the carrier signal, fc.<br>✓ For example,<br>a "1" could be represented by f1=fc +Δf,<br>a "0" could be represented by f2=fc-Δf.<br>  <br>*Binary frequency shift keying (BFSK)*<br>✓ One way to think about binary FSK (or BFSK) is to consider two carrier frequencies.<br>✓ In below figure, we have selected two carrier frequencies, f1 and f2. | 10 | 2 | 4 | 1 | 1.7.1 |

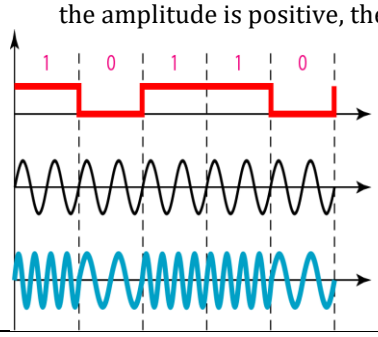


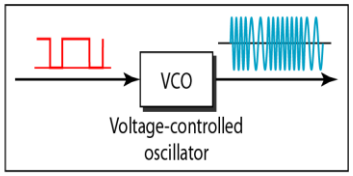




- ✓ We use the first carrier if the data element is 0; we use the second if the data element is 1.
- ✓ However, note that this is an unrealistic example used only for demonstration purposes.
- ✓ Normally the carrier frequencies are very high, and the difference between them is very small.

*Implementation*

- ✓ There are two implementations of BFSK: noncoherent and coherent.
- ✓ In noncoherent BFSK, there may be discontinuity in the phase when one signal element ends and the next begins.
- ✓ In coherent BFSK, the phase continues through the boundary of two signal elements. Noncoherent BFSK can be implemented by treating BFSK as two ASK modulations and using two carrier frequencies.
- ✓ Coherent BFSK can be implemented by using one voltage-controlled oscillator (VeO) that changes its frequency according to the input voltage
- ✓ Below figure shows the implementation. The input to the oscillator is the unipolar NRZ signal. When the amplitude of NRZ is zero, the oscillator keeps its regular frequency; when the amplitude is positive, the frequency is increased.




**Course Outcome (CO) and Bloom's level (BL) Coverage in Questions**