**Indian Institute of Information Technology-Allahabad**

**End Semester Exam – May - 2020**

**Computer Networks**

**Time: 2 Hour 15 Mins. MM: 80**

**Note:**

1. **Attempt all questions.**
2. **Write answer in brief. Unnecessary writing may result in negative marking.**
3. **(25 Marks)**
4. Explain clearly the responsibilities and the list protocols for each layer of ISO-OSI reference model. How OSI reference model is different from TCP/IP reference model? List at least three protocols of each layer of TCP/TP reference model.
5. Binary data can be transmitted by encoding each data bit or a group of bits, with a signal level. Draw the signal-time diagram that results in encoding the bit pattern 10110001110, using
6. a NRZ encoding method,
7. the Manchester encoding method,
8. the Differential Manchester encoding method.
9. Discuss the advantages and disadvantages of Differential Manchester encoding over NRZ-I.
10. Suppose that a digitized TV picture is to be transmitted from a source that uses 480 x 500 pixels, where each pixel can take one of 32 grey levels. Assume that the frame rate is 30 pictures per second. Find the minimum bandwidth required of an analogue channel having a 35dB signal to noise ratio that can support this digital TV transmission.
11. Write the prototype of accept and connect system calls and explain the meaning of various parameters used in the calls. Explain the relationship between the accept system call and the connect system call when establishing connection-oriented TCP sockets on a UNIX system?
12. **(25 Marks)**
13. Besides increasing the size of the address space, describe 3 things that Ipv6 introduces that should make routing simpler and faster.
14. Explain in detail the Link State routing algorithm. How it differ from distance vector algorithm?

1. Discuss the header format of TCP protocol and explain significance of different fields present in the header? Also give the significance of flags available in the TCP header.
2. Explain and Run Dijkstra’s algorithm on following graph to find the shortest path from node r to node s.



1. For the following network, show how the distance vector algorithm builds the routing table for node D.



1. **(10 Marks)**
   1. Construct the Hamming Code sequence for 1001000 using even parity.
   2. Demonstrate the error detection and correction at the receiving end for the above data stream with an error in bit position 6.
   3. Give a simple example of the count-to-infinity problem.
2. A router implements fair queuing of three incoming flows over a single outgoing channel. In this problem, you will determine the order of packets sent out from the router and calculate statistics from your results. **(10 Marks)**

Assume for simplicity that the problem starts at time *t* = 0 and that sending a packet of length *N* requires *N* time units. Packets arrive on the three flows, named A, B, and C as follows:

**A. packets of length 15 arrive at times 0, 10, 20, 40, 50**

**B. packets of length 5 arrive at 1, 6, 11, 16, 21, 26, 31, 36**

**C. packets of length 9 arrive at 45, 46, 47, 48, 49**

All service counters start at 0 at time 0.For each packet sent on the outgoing link, record the start time, the packet delay (time the packet spent in the queue), the service counter for each flow at that time, and the name of the packet*(e.g.,* write *B3* for flow B's third packet).

1. A new system administrator checks 10 machines in a room and figure out the network configuration for these machines as below: **(10 Marks)**

|  |  |  |
| --- | --- | --- |
| **Machine** | **IP address** | **Netmask** |
| **1** | **172.68.160.1** | **255.255.240.0** |
| **2** | **172.68.179.2** | **255.255.240.0** |
| **3** | **172.68.177.3** | **255.255.240.0** |
| **4** | **172.68.178.4** | **255.255.240.0** |
| **5** | **172.68.162.5** | **255.255.240.0** |
| **6** | **172.80.168.6** | **255.255.252.0** |
| **7** | **172.80.169.7** | **255.255.252.0** |
| **8** | **172.80.172.8** | **255.255.252.0** |
| **9** | **172.80.172.9** | **255.255.252.0** |
| **10** | **172.80.173.10** | **255.255.252.0** |

* 1. How many networks are there in that room? Explain.
  2. Show the network ID for each network.
  3. Categorize 10 machines based on networks they belong to.