UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2017

Program: B. Tech EE	**Semester – V**
Subject (Course): Data Communication & Networking	**Max. Marks : 100**
Course Code : ELEG444	**Duration : 3 Hrs**
No. of page/s: 03	

SET-1

SECTION – A

Answer All. Each Question carries 5 marks

1. Classify Ethernet types with respect to speed and maximum length of cable
2. In wireless LANs highlight the differences between an Ad-hoc network and a network with infrastructure through a neat figure.
3. a)Change the following IPv4 addresses from binary notation to dotted-decimal notation.

   a. 10000001 00001011 00001011 11101111

   b. 11000001 10000011 00011011 11111111

   b) Show how the NIC address ***47:20:1B:2E:08:EE*** is sent out on line.

4. In Sliding-Window flow control, suppose *k* bits are used to specify the sequence numbers of frames. It can support the range of sequence numbers from 0 to 2^k-1. Explain, by an example, why the maximum window size cannot exceed 2^k-1.

SECTION – B

Answer Any Four. Each Question carries 10 marks

5. An image is 1024x768 pixels with 3 bytes/pixel. Assume the image is uncompressed. How long does it take to transmit it?
   a) Over a 56-kbps modem channel?
   b) Over a 1-Mbps cable modem?
   c) Over a 10-Mbps Ethernet?
   d) Over 100-Mbps Ethernet?
6. Name the OSI layers that performs the following functions:
   a. Has a local address that was built in by the LAN adapter card manufacturer.
   b. Puts out and receives signals through an external port (connector).
   c. Provides standard services to various computer programs.
   d. It uses a hierarchical address assigned by the local network manager.
   e. Responsible for end-to-end connections across a multi-node switched network or router network.

7. a) Network Address Translation table is given below.
Calculate the values of x, y, z (6M)

b)

Range of IP Addresses	Total IPs possible
10.0.0.0 – 10.255.255.255	2^x
172.18.0.0 – 172.31.255.255	2^y
192.168.1.0 – 192.168.255.255	2^z

Consider the IPv4 addresses in the figures given below. Identify which is two-level hierarchy and which is three level hierarchy. Also write the names of each field

Fig. A

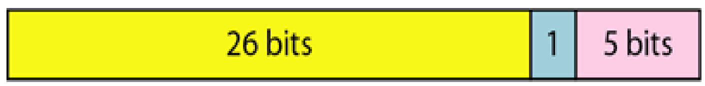
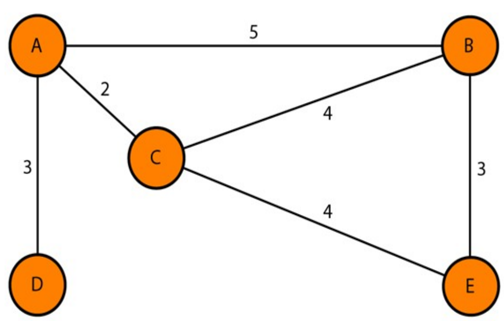


Fig. B (4M)

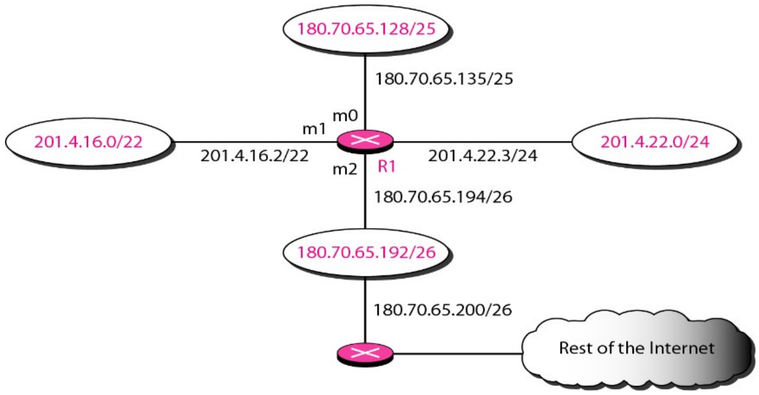
8. A host with IP address 130.23.43.20 and physical address B2:34:55:10:22:10 has a packet to send to another host with IP address 130.23.43.25 and physical address A4:6E:F4:59:83:AB. The two hosts are on the same Ethernet network. Draw the figure to show ARP request and reply packets encapsulated in Ethernet frames.
9. Consider the network given in the figure
   a) Design the routing table for each node by taking into consideration the cost of links given using distance vector routing.
   b) Differentiate between inter-domain and intra-domain routing protocols



SECTION-C

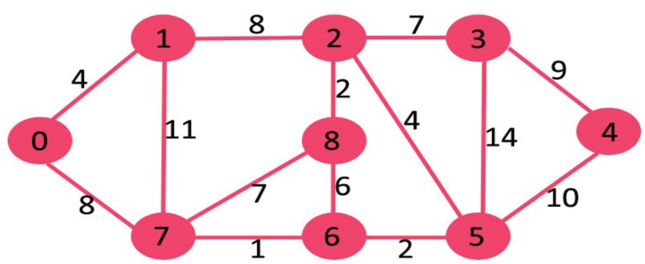
Answer any two. Each question carries 20marks

10. Design the routing table for router R1, using the configuration in figure below.



a) Show the forwarding process if a packet arrives at R1 in Figure with the destination address 180.70.65.140.
b) Show the forwarding process if a packet arrives at R1 in Figure with the destination address 201.4.22.35.
c) Show the forwarding process if a packet arrives at R1 in Figure 22.6 with the destination address 18.24.32.78.

11. Design a Dijkstra's shortest path algorithm (also write the algorithm) for the topology of the network shown in the figure. Redraw the network by showing every step in detail and mentioning the cost of links at every node.



12. Design a Go-Back-N Automatic Repeat Request protocol for flow control with a window size of 3(three). At the receiver side use piggybacking method. Write the sender side and receiver side algorithm.

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SET-2

SECTION – A

Answer All. Each Question carries 5 marks

1. Expand i) SMTP ii) TELNET iii) DNS iv) HTTP v) UDP
2. Define i) Maximum burst size ii) Peak data rate iii) Average data rate
3. Expand the generic domain labels given
   i) .biz ii) .aero iii) .info iv) .org v) .net
4. OSI model has 7 layers which are divided into three sub-groups. Identify the layers in each sub-group according to
   i) Layers that deals with physical aspects of moving data from one device to another
   ii) Layer that links the two sub-groups
   iii) Layers that allow interoperability among unrelated software systems.

SECTION – B

Answer Any Four. Each Question carries 10 marks

5. Consider the frame shown in the figure. Recreate the frame using Bit-stuffing and write the frame along with header and trailer, that are sent and received across two nodes. Also explain the use of bit-stuffing.

   0001111111001111101000

6. Assume that, in a Stop-and-Wait ARQ system, the bandwidth of the line is 1 Mbps, and 1 bit takes 20 ms to make a round trip.
   i) What is the bandwidth-delay product?
   ii) If the system data frames are 1000 bits in length, what is the utilization percentage of the link?
   iii) What is the utilization percentage of the link if we have a protocol that can send up to 15 frames before stopping and worrying about the acknowledgments?
   Comment on the answers you get.

7. Find the class of each address.

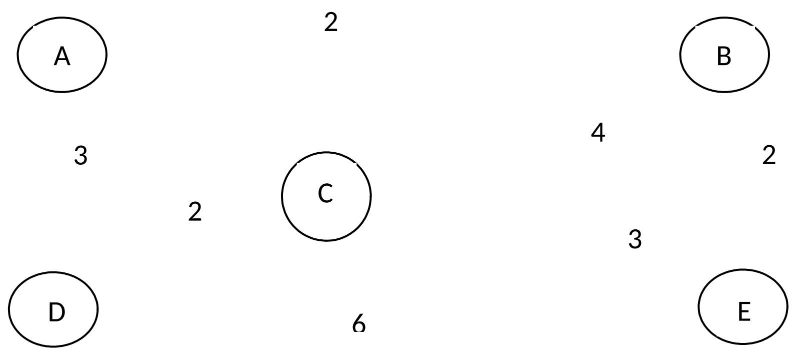
i) 00000001 00001011 00001011 11101111
ii) 190.168.2.100
iii) 11000001 10000011 00011011 11111111
iv) 14.23.120.8
v) 252.5.15.111

8. What do you understand by quality of service in data communication? Discuss two scheduling and two traffic shaping techniques to improve the quality of service.
9. Differentiate between intra-domain and inter-domain routing protocols

SECTION-C

Answer any two. Each question carries 20marks

10. Design a bidirectional algorithm for the Stop-and-Wait ARQ protocol using piggybacking. Note that both the parties need to use the same algorithm. Write the algorithms
11. Explain the Dijkstra algorithm. Design a routing table for node A, B in the figure 2 using Dijkstra algorithm.



12. A) In distance vector routing, each node shares its routing table with its immediate neighbors periodically and when there is a change. By comparing A's old table and modified table with table received from C, write the new routing table for A

To	Cost	Next
A	0	—
B	5	—
C	2	—
D	3	—
E	∞	

A's old table

To	Cost	Next
A	4	C
B	6	C
C	2	C
D	∞	C
E	6	C

A's modified table

To	Cost
A	2
B	4
C	0
D	∞
E	4

Received from C

(10M)

B) An organization is granted the block 130.56.0.0/16. The administrator wants to create 1024 subnets.

i) Find the subnet mask
ii) Find the number of addresses in each subnet
iii) Find the first and last addresses in subnet 1
iv) Find the first and last address in subnet 1024 (10M)