DHARMSINH DESAI UNIVERSITY, NADIAD
FACULTY OF TECHNOLOGY
B.TECH. SEMESTER V [INFORMATION TECHNOLOGY]
SUBJECT: (IT 505) COMPUTER AND COMMUNICATION NETWORK

Examination	**: First Sessional**	**Seat No.**	**: _____**
Date	**: 29/07/2015**	**Day**	**: Wednesday**
Time	**: 11 :15 to 12:30**	**Max. Marks**	**: 36**

INSTRUCTIONS:
1. Figures to the right indicate maximum marks for that question.
2. The symbols used carry their usual meanings.
3. Assume suitable data, if required & mention them clearly.
4. Draw neat sketches wherever necessary.

Q.1 Do as directed.

(a) Match the following: **[2]**

P. Data link layer	1. Ensures reliable transport of data over a physical point-to-point link
Q. Network layer	2. Encodes/decodes data for physical transmission
R. Transport layer	3.Allows end-to-end communication between two processes
S. Presentation layer	4. Routes data from one network node to the next

(b) Which of the following is NOT true with respect to a transparent bridge and a router? **[2]**
(a) Both bridge and router selectively forward data packets
(b) A bridge uses IP addresses while a router uses MAC addresses
(c) A bridge builds up its routing table by inspecting incoming packets
(d)A router can connect between a LAN and a WAN

(c) In a sliding window ARQ scheme, the transmitter's window size is N and the receiver's window size is M. The minimum number of distinct sequence numbers required to ensure correct operation of the ARQ scheme is: **[2]**
(A) min(M,N) (B) max(M,N) (C) M+N (D)MN

(d) Which of the following protocol(s) does not accept out of order frames on a receiver? **[2]**
(1)Stop and Wait(2) Go back N(3)Selective Repeat

(e) Consider the Pure ALOHA, Slotted ALOHA, and Non-persistent CSMA. Which one will you use at high load? Why? **[2]**

(f) A selective repeat ARQ is using the sequence numbers 0 to 7. What is the size of window? **[2]**

Q.2 Attempt ***Any Two*** from the following questions. **[12]**

(a) **(1)**Consider a selective repeat sliding window protocol that uses a frame size of 1 KB to send data on a 1.5 Mbps link with a one-way latency of 50 msec. To achieve a link efficiency of 60%, then what is the minimum number of bits required to represent the sequence number field ? **[3]**
(2) A 2 km long broadcast LAN has 10^7 bps bandwidth and uses CSMA/CD. The signal travels along the wire at 2×10^8 m/s. What is the minimum packet size that can be used on this network? **[3]**

(b) **(1)**A LAN uses Mok and Ward's version of binary countdown. Stations A, B, C, D, E, F, G, H, J and K using the "binary countdown protocol with virtual station numbers" have the virtual station numbers 9, 8, 7, 6, 5, 4, 3, 2, 1, and 0 at a certain instant. The next three stations to send are E, C, and A, in that order. What are the new virtual station numbers after all three have finished their transmissions? **[3]**
(2) Following devices works on which layer of OSI model. **[3]**
Hub, Bridge, Repeater, Switch, Router, Gateway.

(c) **(1)**In a data link layer, character-oriented framing and character stuffing method is applied. At the sender, if the character string delivered by the network layer to the data link layer is given as follows, obtain the character string at the data field of the sender's data link layer frame. **[3]**

A B FLAG ESC C ESC D E F FLAG G

At the receiver, if the character string at the data field of the receiver's data link layer frame is given as follows, obtain the character string that will be delivered by the data link layer to the network layer

ESC FLAG A ESC ESC B C ESC FLAG ESC ESC

(2) In the data link layer of a computer network, bit-oriented framing and bit stuffing method is applied. Assuming that 01110 bit string is used as the starting and ending delimiter, **[3]**

At the sender, if the bit string delivered by the network layer to the data link layer is given as follows, obtain the bit string at the data field of the sender's data link layer frame. 1 0 1 1 1 1 1 1 0 0 1 1 1 0 0 0 1 1 1 1

At the receiver, if the bit string delivered by layer 1 to layer 2 is as follows, obtain the bit string before bit stuffing. 0 1 1 1 0 0 0 1 0 1 0 0 1 1 0 0 1 1 0 1 1 0 0 0 1 1 0 0 1 1 0 1 0 0 0 1 1 1 0

Q.3 (a) **(1)**Consider a LAN with four nodes S1, S2, S3 and S4. Time is divided into fixed-size slots, and a node can begin its transmission only at the beginning of a slot. A collision is said to have occurred if more than one node transmit in the same slot. The probabilities of generation of a frame in a time slot by S1, S2, S3 and S4 are 0.1, 0.2, 0.3 and 0.4, respectively. Then what is the probability of sending a frame in the first slot without any collision by any of these four stations? **[3]**

(2) Determine the maximum length of the cable (in km) for transmitting data at a rate of 500 Mbps in an Ethernet LAN with frames of size 10,000 bits. Assume the signal speed in the cable to be 200000 km/s. **[3]**

(b) Two neighboring nodes (A and B) use the selective-repeat ARQ with a 3-bit sequence number. Assuming A is transmitting and B is receiving, show the content of the window and the positions of the respective pointers at both nodes A and B for the following succession of events. **[6]**

(a) Before A sends any frames.

(b) After A sends frames 0, 1, and 2; B acknowledges 0 and 1, and both ACK's are received by A.

(c) After A sends frames 3, 4, and 5; B sends NAK to A ; then B acknowledges Frame 3 to 5.

OR

Q.3 (a) 16 stations (1 through 16) are using the "adaptive tree walk protocol" to access a shared channel. In the contention slot 0, stations 2, 3, 5, 7, 11, and 13 suddenly become ready at the same time to transmit frames, and start contending for the channel. **[6]**

a) Draw the binary tree defining the tree walk.

b) Starting from the contention slot 0, determine which stations will compete under Which node and which station will transmit a frame?

c) How many contention slots of one bit are needed to resolve contention?

(b) **(1)** A 12-bit Hamming code whose hexadecimal value is 0XE4F arrives at a receiver. What was the original value in hexadecimal? Assume that not more than one bit is in error. Number the bits from left to right. **[3]**

(2) A link has a transmission speed of 10^6bits/sec. It uses data packets of size 1000 bytes each. Assume that the acknowledgement has negligible transmission delay, and that its propagation delay is the same as the data propagation delay. Also assume that the processing delays at the nodes are negligible. The efficiency of the stop-and-wait protocol in this setup is exactly 25%. What is the value of the one-way propagation delay (in milliseconds)? **[3]**