Unique Paper Code	:	**32341303-OC**
Name of the Course	:	**B.Sc. (H) Computer Science**
Name of the Paper	:	**Computer Networks**
Semester	:	**III**
Duration	:	**3 Hours**
Maximum Marks	:	**75**
Year of Admission	:	**2015, 2016, 2017, 2018**

Instructions for Candidates:

Attempt any Four out of Six questions.
All Questions carry equal marks.

Q1 The network **200.1.2.30** has been subdivided into 4 subnets.

(i) Which class the given IP address belongs to?
(ii) Give the subnet mask for the given IP address.
(iii) Give the IP addresses of these 4 subnets.
(iv) How many hosts can be on each subnet?
(v) Determine the starting IP address and the last IP address of each subnet.
(vi) Determine which network the IP address **200.1.2.130** belongs to.
(vii) Determine the limited broadcast address for each subnet.

Q2 What characteristics of the carrier signal are changed to represent the digital signal in each of the following modulation techniques: - ASK, FSK, PSK and QAM?
Which of the four digital to analog modulation techniques (ASK, FSK, PSK, QAM) is most susceptible to noise? Defend your answer.
In a QAM modulation scheme, there are 4 amplitude levels and 16 phase levels and bit rate is 72 Kbps. Calculate the baud rate.

Q3 The following character encoding is used in a data link protocol:
A: 11010101; B: 10101001; FLAG: 01111110; ESC: 10100011.
Show the bit sequence transmitted (in binary) for the five character frame. A ESC B ESC FLAG when each of the following framing methods are used:

i. Character count
ii. Flag bytes with byte stuffing.
iii. Starting and ending flag bytes, with bit stuffing

Also find the original data for the given output obtained after applying byte-stuffing technique:

FLAG A B ESC ESC C ESC ESC ESC FLAG ESC FLAG D E FLAG.

Q4 Draw the pulse diagram for the bit stream **0011001100110011** and also calculate the average signal rate for the following line coding schemes:

i. **Manchester**
ii. **Differential Manchester**
iii. **Polar Return to Zero**
iv. **Polar Non Return to Zero - Level**
v. **Polar Non Return to Zero – Inversion**

Explain the problems associated with Polar NRZ techniques.

Q5 What is the **maximum window size** for data transmission in **Selective Repeat and Go Back N protocol** if n bit frame sequence numbers are used? Consider a scenario for S**elective Repeat protocol** where frames with sequence numbers from 0 to 4 have been transmitted by the sender. Now assume that the following sequence of event occurs:

(i) frame 0 does time-out
(ii) A new frame with sequence number 5 is transmitted.
(iii) frame 1 and frame 2 time-out
(iv) A new frame with sequence number 6 is transmitted.

At every stage show the status of the sender's window i.e. the outstanding frames in the sender's window.
Consider another scenario for **Go Back N sliding window protocol** with window size 3 where sender X needs to send a message consisting of 9 packets to receiver Y. If every 5th packet that sender X transmits gets lost (but no ACKs from receiver Y ever get lost), then how many packets sender X will transmit for sending the message to receiver Y?

Q6 How long will it take a station to realize that there has been a collision in CSMA/CD protocol? Show the working of Back-off algorithm for the following scenario:
Assume X and Y are the only two stations on the Ethernet. Each of them has a long queue of frames to be transmitted. Both X and Y attempts to transmit a frame at the same time and the frames collide. Assume that X wins the first Back-off race. At the end of this successful transmission by X, both X and Y attempt to transmit again and collide. Show all the possible cases and find the probability of station X wins over station Y.