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Exam in Computer Networks (Open Book)

- Take printout of this paper and solve using pen in your own handwriting. If you are unable to print, then solve on plain paper using Question Numbers.
- Take Picture of your answers and combine them into a single PDF file (Free online tools available). The file name should be your Roll Number. Upload solution on Google Class room before the deadline. 15-11-2020, 11:55pm.
- Make sure that all questions are in the ascending order.
- Avoid needless and irrelevant details as it may result in the deductions of points. Try to elaborate your knowledge and avoid copying the lecture slides.

Good Luck!!

Section I

Q.1 Multiple Choice Questions **(20 p)**

1) In Bipolar AMI encoding, we need to assure at least ____7____ baud rate (signals) to transmit any 7 bits?

a) 9
b) 14
c) 7 ✓
d) 11
e) A, Band D
f) C and D
g) All of the Above

2) _____ schemes require more bandwidth but are based on Bipolar AMI to reduce requirement on clock synchronization.

a) Manchester
b) B8ZS
c) NRZ-I
d) HDB3
e) A, B and D ✓
f) B and D
g) All of the above

3) One of the main advantages of packet switching is:

a) High multiplexing gain
b) Simplified network
c) No media reservation required

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d) All of the Above

4) In Manchester encoding for Ethernet, we need to assure at least 16 baud rate (signals) to transmit any 8 bits?

a) 8
b) 16
c) 7
d) 11
e) A, Band D
f) C and D
g) All of the Above

5) Which of the following services use TCP?

a) SMTP
b) HTTP
c) TFTP
d) FTP
e) a,b and d
f) c and d
g) All of the Above

6) Switch checks the first 64 bytes and then forwards frames in Fragment free mode.

a) Cut-Through
b) Store and Forward
c) Fragment Free
d) None of the above

7) STP eliminates the broadcast storms and MAC Database instability problem in the redundant topology.

a) STP
b) CSMA/CD
c) TDMA
d) FDMA

8) The wireless networks exhibit following characteristics as compared to the wired networks:

a) High loss rate
b) High jitter
c) Increased delay
d) All of the above

9) Lower frequency will result in increased range as compared to the higher frequency levels.

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a) increased range
b) more attenuation
c) shorter antenna
d) None of the above

10) The DoD model (also called the TCP/IP stack) has four layers. Which layer of the DoD model is equivalent to the Network layer of the OSI model?

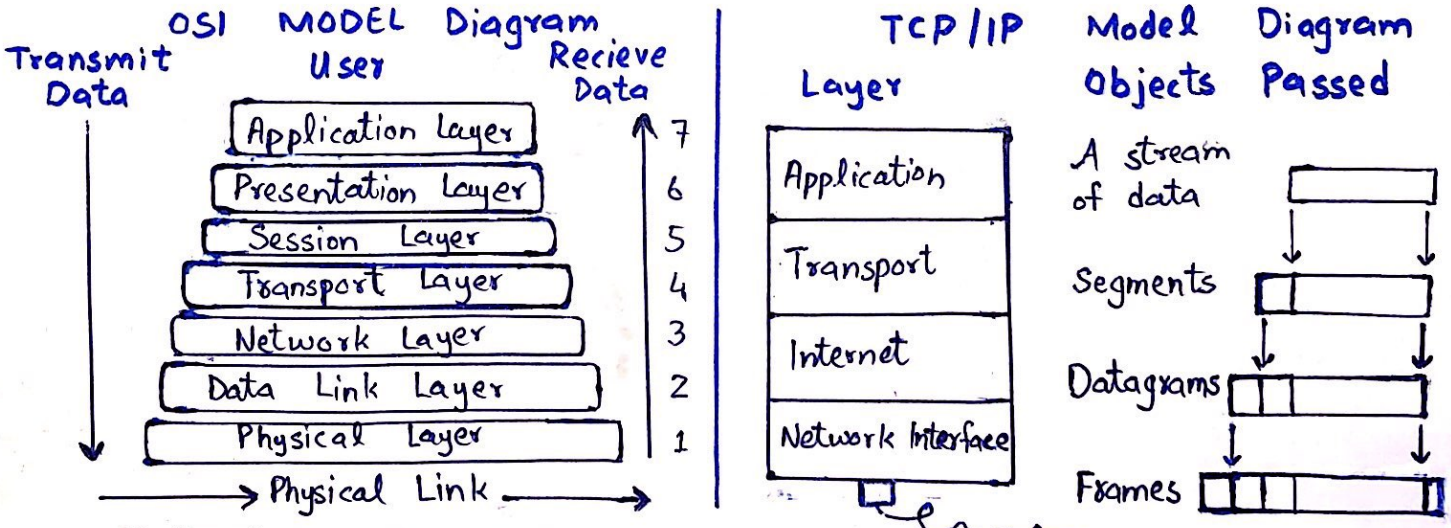
a) Application
b) Host-to-Host
c) Internet
d) Network Access

Section II

Note: Attempt all questions

2. **(10 p)**

a) Draw the diagrams of OSI and TCP/IP models?



b) Describe the problem of "hidden terminals" with the help of diagram?

- **HIDDEN TERMINALS:-**
  - main issue: transmission ranges of transmitters
    - A reaches B, not C
    - C reaches B, not A
    - B reaches both A, C
  - A and C "hidden" from each other
    - A and C simulation, transmits to B
    - Collision at B
  - CS (Carrier Sense) fails
    - A and C cannot sense each other

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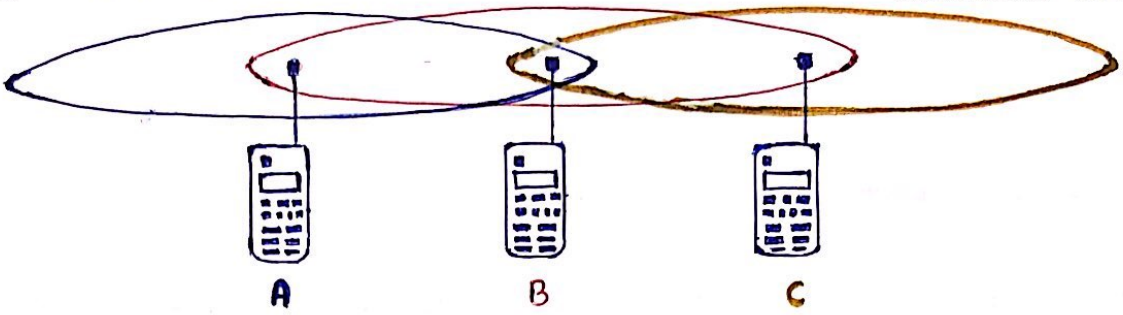

c) What is the main difference between "Aloha" and "Slotted-Aloha"?

ALOHA	SLOTTED - ALOHA
• In Pure Aloha, any station can transmit data at any time	• In slotted Aloha, any station can transmit data only at beginning of any time slot.
• Maximum efficiency = 18.4%	• Maximum efficiency = 36.8%
• Does to reduces the no. of collisions	• It reduces the no. of collisions to half thus doubles the efficiency.
• Vulnerable time = 2 x Tt	• Vulnerable time = Tt
• Time is continuous and is not globally synchronaized.	• Time is discrete and is globally synchronaized.

d) What are the main differences between Circuit and Packet Switching?

CIRCUIT SWITCHING	PACKET SWITCHING
• "Bandwidth allocation" (Reservation of resources)	• No reservation needed (Packets can get lost, store & Forward)
• Low multiplexing gain	• High multiplexing gane
• Intelligent network - Simple hosts	• Intelligent hosts - Simple network
• All packets use same path.	• Packets travel independentily.

e) Differentiate between ASK, FSK and PSK.

ASK	FSK	PSK
• It's noise immunity is low.	• It's noise immunity is high	• It's noise immunity is high
• It's error probability is high	• It's error probability is low	• It's error probability is low
• It's complexity is simple	• It's complexity is moderately complex.	• It's complexity is very complex.
• It's performance in presence of noise is Poor.	• It's performance in presence of noise is better than ASK	• It's performance in presence of noise is better than FSK
• It's bit rate suitable upto 100 bits/sec	• It's bit rate suitable upto about 1200 bits/sec	• It's bit rate suitable for high bit rates.

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3. **(10 p)**

Suppose three devices A, B and C in a CDMA network with the following 8-bit orthogonal codes:
A = 10101010
B = 11001100
C = 10010110
The transmission power of B is twice as compared to A and C. Perform all the steps to send and detect 00 for Sender A, 10 for Sender B and 0X for Sender C (where X means that the sender doesn't transmit in this interval).

A = 10101010 → transmit → 00

B = 11001100 → transmit → 10

C = 10010110 → transmit → 0X

Assign: +1 for '1' and -1 for '0'

A = {10101010} = {+1, -1, +1, -1, +1, -1, +1, -1}

B = {11001100} = {+1, +1, -1, -1, +1, +1, -1, -1}

C = {10010110} = {+1, -1, -1, +1, -1, +1, +1, -1}

1st INTERVAL

Transmitted data

A = 0	-1	+1	-1	+1	-1	+1	-1	+1
B = 1	+1	+1	-1	-1	+1	+1	-1	-1
C = 0	-1	+1	+1	-1	+1	-1	-1	+1
Signals (S)	-1	+3	-1	-1	+1	+1	-3	+1

Detection:-

A : -1 -3 -1 +1 +1 -1 -3 -1 = -8

B : -1 +3 +1 +1 +1 +1 +3 -1 = 8

C : -1 -3 +1 -1 -1 +1 -3 -1 = -8

A: -8 ⇒ 0

B: +8 ⇒ 1

C: -8 ⇒ 0

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2nd INTERVAL

A = 0	-1	+1	-1	+1	-1	+1	-1	+1
B = 0	-1	-1	+1	+1	-1	-1	+1	+1
C = x	Idle							
Signals (S)	-2	0	0	+2	-2	0	0	+2

Detection:-

A : $-2\ 0\ 0\ -2\ -2\ 0\ 0\ -2 = -8 \Longrightarrow 0$

B : $-2\ 0\ 0\ -2\ -2\ 0\ 0\ -2 = -8 \Longrightarrow 0$

C : $-\not{2}\ 0\ 0\ +\not{2}\ -\not{2}\ 0\ 0\ +\not{2} = 0 \Longrightarrow$ Nothing (x)

Hence, **Results** are:-

A : transmitted ⟶ 00 while detected ⟶ 00

B : transmitted ⟶ 10 while detected ⟶ 10

C : transmitted ⟶ 0x while detected ⟶ 0x

4. **(10 p)**

Draw the MAC header (frame) of IEEE 802.11. Explain all the fields (bit patterns) like Frame Control, TO DS, and From DS bits with the help of table.

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→ MAC FRAME:- OF IEEE 802.11 :-

The MAC Layer frame consists of 9 fields. The following figure shows the basic structure of an IEEE 802.11, MAC data frame along with the content of the frame control field.

Frame Control	Duration /ID	Address 1	Address 2	Address 3	SC	Address 4	Data	CRC
2 bytes	2 bytes	6 bytes	6 bytes	6 bytes	2 bytes	6 bytes	0-2312 bytes	4 bytes

Protocol Version	Type	Subtype	To DS	From DS	More Frag	Retry	Power Mgmt	More data	WEP	Order
2 bits	2 bits	4 bits	1 bit	1 bit	1 bit	1 bit	1 bit	1 bit	1 bit	1 bit

IEEE 802.11 MAC Frame Structure

- **Frame Control (FC):-**

It's 2 bytes long field which defines type of frame & some control information. Various fields present in FC are:-

1) Version:-
It's a 2 bit long field which indicates the current protocol version which is fixed to be 0 for now.

2) Type:-
It's a 2 bit long field which determines the function of frame i.e. management (00), control (01) or data (10). The value 11 is reserved.

3) Subtype:-
It's a 4 bit long field which indicates subtype of the frame like 0000 for association request, 1000 for beacon.

4) To DS:-
It's a 1 bit long field which set indicates that destination frame is for DS (distribution system).

5) From DS:-
It's a 1 bit long field which when set indicates frame coming from DS.

6) More frag (More Fragments):-

It's 1 bit long field which when set to 1 means frame is followed by other fragments.

7) Retry:-

It's a 1 bit long field, if the current frame is a retransmission of an earlier frame, this bit is set to 1.

8) Power Mgmt (Power Management):-

It's 1 bit long field, which indicates the mode of a station after successful transmission of a frame. Set to 1 the field indicates that the station goes into power-save mode. If the field is set to 0, the station stays active.

9) More data:-

It's 1 bit long field which is used to indicates a reciever that a sender has more data to send than the current frame. This can be used by an access point to indicate to a station in power-save mode that more packets are buffered or it can be used by a station to indicate to an access point after being polled that more polling is necessary as the station has more data ready to transmit.

10) WEP:-

It's 1 bit long field which indicates that the standard sequrity mechanism of 802.11 is applied.

11) Order:-

It's 1 bit long field, if this bit is set to 1 the recieved frames must be prossessed in strict order.