POSSESION OF MOBILES IN EXAM IS UFM PRACTICE.

Name _____ _____ **Enrollment No.**____ _____

Jaypee Institute of Information Technology, Noida
End Term Examination, 2023
B.Tech VI_Semester

Course Title: Computer Network and Internet of Thing **Maximum Time: 2 Hrs**
Course Code: 18B11CS311 **Maximum Marks: 35**

S. No.	Description
CO1	Defining the basics of networking, components and underlying technologies.
CO2	Illustrate the various key protocols in OSI and TCP/IP protocol suite and explain various application protocols.
CO3	Examine various transport protocols and its performance enhancing mechanisms.
CO4	Determine the shortest path for the network using various routing protocols and evaluate it.
CO5	Chose IP and MAC Addressing mechanism and data link protocols to solve communication, error detection, and correction problems.
CO6	Identification and description of various components, architectures, and protocols of IoT and their real life problems.

Q1: [CO1, CO2, CO3, CO4] [10 Marks] Answer the following:

a) **[CO1] [2 Marks]** Think about the network where all links have a data rate of 1.2 Mbps and use TDM with 16 slots. Assume host A needs 400 ms to create a complete circuit with host B before starting to send the file. How long will it take for the file to be send from host A to Host B if it is 412 KB in size?

b) **[CO2] [1 Mark]** If the same number of objects are retrieved through different HTTP connections. Which among: non-persistent serial, non-persistent parallel or persistent parallel will be faster?

c) **[CO3] [4 Marks]** Suppose sender A wants to transmit 8 packets to host B in which every 4th packet is lost. Given a window size of 3, calculate and compare the number of transmissions required in case of Go-Back N and Selective Repeat. Also, discuss the case where less buffer space and sufficiently large bandwidth is available, than which protocol is best to choose w.r.t efficiency?

d) **[CO4] [3 Marks]** Suppose, Host 1 with IP address 193.162.2.97 is connected to Host 2 with IP address 193.162.2.80 via two routers R1 and R2. Also, R1 has two IP addresses, such as 193.162.2.135 and 193.162.2.110 respectively. Similarly, R2 has two IP addresses, such as 193.162.2.67 and 193.162.2.155 respectively. The netmask used in the network is 255.255.255.224. For the data provided above, how many distinct Subnets exists in the Network? Also provide the subnet IDs in each case.

Q2: [CO5] [3 Marks] If CRC polynomial generator **$G(X)= X^4 +X+1$** is used and sequence of bits to be sent is **1101101**. Compute the transmitted sequence of bits for this data. Now, if the data received is having an error i.e.: 3rd bit is changed from MSB. Show how the receiver will detect the error?

Q3: [CO5] [1.5+1.5+1=4 Marks] A receiver has received the following hamming code **0100110101011001101000011110**1, at sender side, the parity bits calculated is given as **00101.**

a) Calculate the parity bits at receiver side using even parity.
b) Based on the given details, find out which bit is corrupted in the given hamming code.
c) Find out the correct message send from the sender in plaintext (English) language if 8 bits represent 1 character.

Q4: [CO5] [6 Marks] Suppose if there are two stations S1 and S2 attached to opposite ends of 2 km long cable having a propagation speed of 100 m/s, bandwidth 40 bps. Both nodes having only 1 frame to send consist of 2000 bits including header. Now, M attempt to transmit at time T=0 and N at T=2 secs. If first collision occurs consider M withdraws K=0 and N draws K=1 in the exponential back off algorithm. After first collision, M withdraws K=0 and N withdraws K=3 for any succeeding collision.

a) What is the minimum size of frame for the ethernet to detect collision? What is the efficiency of CSMA/CD.
b) At what time (in seconds) Node M and N both detect collision?
c) How many bits station N has sent before detecting the collision?
d) At what time (in seconds) last bit of jamming signals is received at M and N?
e) At what time (in seconds) M and N schedules its retransmission?
f) Is there is any second collision? If yes, what is time (in seconds) when both nodes detect collision again?

Q5: [CO5] [3 Marks] There are only P and Q stations on the Ethernet. Each has a fixed number of frames to send. P and Q crash while attempting to submit a frame. Giving P the victory in the first back-off race. Both P and Q attempt to transmit after P successful broadcast, and they eventually collide. Assume P again wins the second back-off race once more. After P's broadcast is a success, P and Q both try to send again and end up colliding. What is the probability that P wins the third Back-off race?

Q6: [CO6] [1+1+1 = 3 Marks] Consider a MQTT network scenario in which there are few clients such as car, temperature sensor, Moisture sensor, Mobile, Tablet, computer, backend database along with a MQTT broker. The car publishes its speed, temperature and moisture sensor also publish their data on broker. The mobile and the tablet subscribes car's speed and temperature readings. The computer subscribes temperature and moisture readings. All the published topics are stored in the backed database. Answer the following

a) Can a mobile act as publisher? Identify the number of publishers and subscribers.
b) It is possible to add any other device in this model?
c) Write the possible topics for car and temperature sensor.

Q7: [CO6] [2+2+2 = 6 Marks] Answer the following:

a) Which of the two layers in IoT reference architecture are known as cross cutting/vertical layers? Describe their responsibilities in detail.
b) List the difference between CoAP and MQTT.
c) Explain the LORa technology which is used in LORa WAN. How end devices join the LORaWAN network?

T3 Solutions — CN & IOT_ Even 2023

Date of Exam :→ 20/05/23, 2:30 PM

Ans-1 :→ (a) R = 1.2 mbps, 16 Slots, File Size (L) = 412 KB, Connection Set up Time = 400 msec.

∴ Bandwidth per user = $\frac{R}{\text{No of Slots}} = \frac{1.2 \text{ mbps}}{16} = 75 \text{ kbps}$ — 1 mark

∴ Trans'n Delay = $\frac{L}{R} = \frac{412 \text{ KB}}{75 \text{ Kbbps}} = 45.001 \text{ sec or } 45001 \text{ msec}$

∴ Total Time Required to Send File = Setup Time + Tran'n Time — 1 mark

∴ Total Time ⇒ 400 msec + 45001 msec

⇒ 45401 msec. or 45.401 sec.

(b) Fastest Order :→ Persistent - Pallalel ① — 1 mark

Non-Persistent Parallel ②

Non-Persistent Parallel ③

(c) Gobackn :→ Window Size 3, Pkt = 8, Every 4th Packet lost

Transmission :→ 1 2 3 ④ 5 6 4 ⑤ 6 7 5 ⑥ 7 8 6 ⑦ 8 7 8

Receiver :→ 1 2 3 4 5 6 4 5 6 7 5 6 7 8 6 7 8 7 8

× × × × × × × × × × × ×

Total Transns = 19 — 1.5 marks

Selective Repeat :→

Transmission :→ 1 2 3 4 5 6 4 7 8 7

Receiver :→ 1 2 3 × 5 6 4 × 8 7 — 1.5 marks

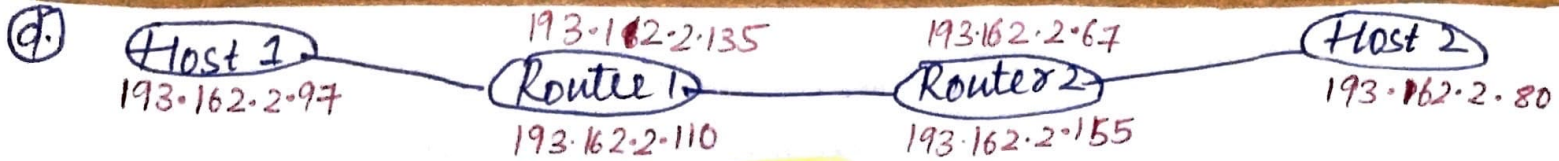
Total Transns = 10

the case where less buffer space and sufficiently large bandwidth is available---- [1] mark.

we should use GBN,

Based on the total buffer space requirement, GBN is better as it requires N+1 (Sender's+ receiver's window size) buffer space whereas S-R requires (N+N) space.

Based on the bandwidth, GBN requires more bandwidth since it sends the complete window whereas S-R send only selective packets which is lost.



Net mask → 255.255.255.224 (3 Subnet Id's)

11111111.11111111.11111111.11100000

Now, First 3 octets are same for all IPaddress ∴ ANDING with Net mask to find Subnets.

2 marks

Subnet 1

Host1 193.162.2.97, AND 255.255.255.224 ⇒ 193.162.2.01100000

Router1 193.162.2.110, AND 255.255.255.224 ⇒ 192.162.2.01100000

Subnet 2

Router1 193.162.2.135, AND 255.255.255.224 ⇒ 192.162.2.10000000

Router2 193.162.2.155, AND 255.255.255.224 ⇒ 192.162.2.10000000

Subnet 3

Router2 193.162.2.67, AND 255.255.255.224 ⇒ 192.162.2.01000000

Host2 193.162.2.80, AND 255.255.255.224 ⇒ 192.162.2.01000000

1 mark

∴ Subnet ID Has 3 bits, Subnets are :→ 011, 100, 010

Answer 2: (a) the parity bits at receiver side using even parity : 10100 [2 marks] [Show Full Process of calculation] 1.5 marks

(b) XOR between sender's parity and receiver's parity [1 mark] 1.5 marks

00101 XOR 10100 = 10001 = 17 in decimal

Means 17th bit from R.H.S. in the given hamming code is corrupted.

(c) Change the 17th bit first. [2 marks] 1 mark

01001101010110011010000111101 = 01001101010100011010000111101

(This is the correct hamming code)

Then remove the parity bits from the hamming code i.e P_1, $P_2P_4P_8P_{16}$

01001101010100011010000111101

Get 0100110101010011010000111

Now to get the message sent in plain text (English)=

01001101010100110100011 1

M S G

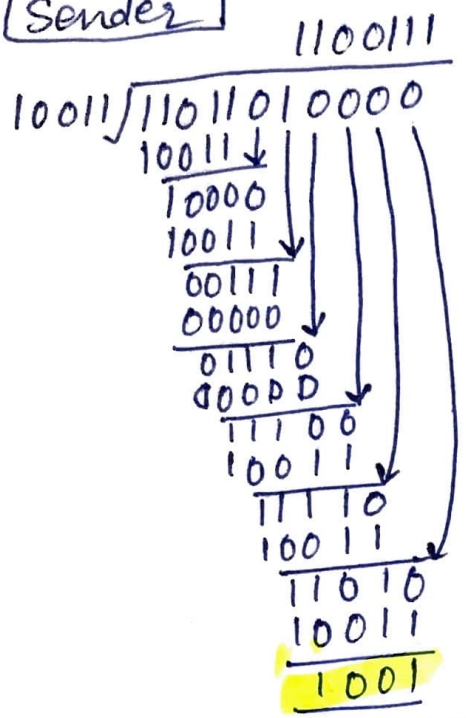
So, the message sent is "MSG".

Ans-2 :→ $G(x) = x^4+x+1 = 10011$

Bit sequence = 1101101

Remainder = 1001

Sender



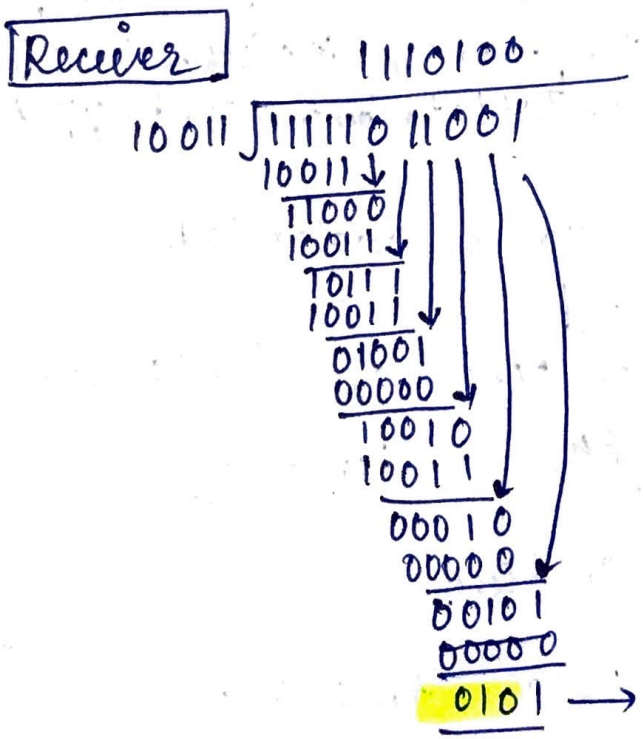
1.5 marks

Transmitted sequence → 11011011001

Now, 8rd Bit From MSB is changed.

∴ Recieved sequence → 11111011001

Receiver



1.5 marks

0101 → Non zero, ∴ Error & discard.

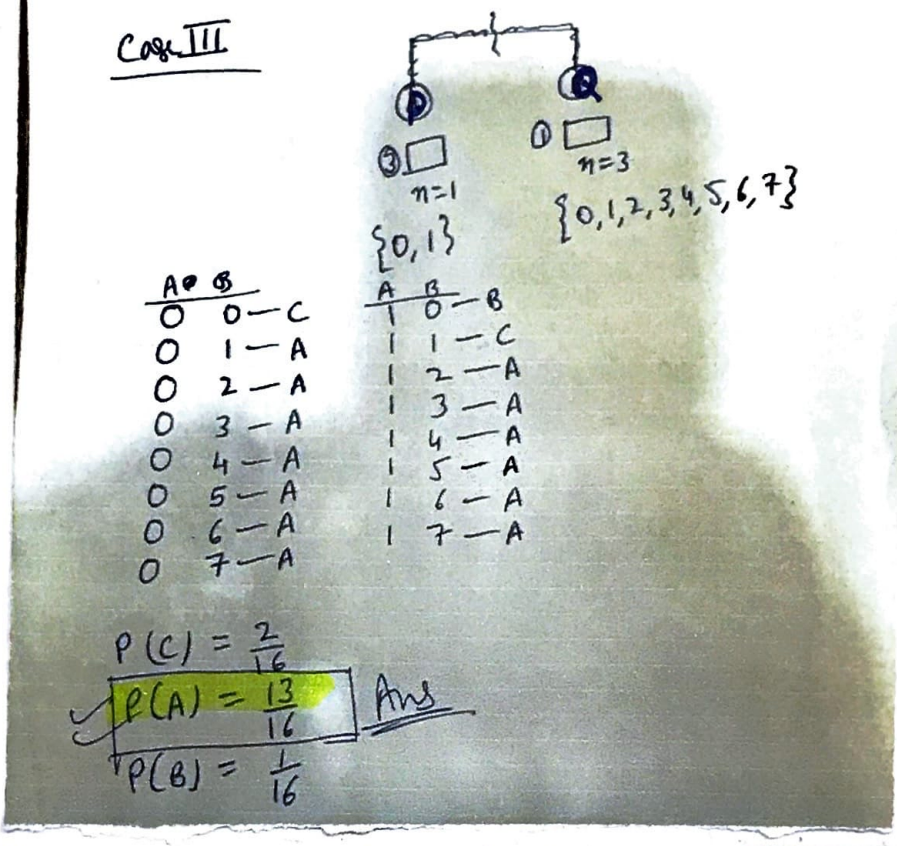
Ans-5 :→ 3 Marks

Exponential Backoff Algorithm

Case I : P wins

Case II : Again P wins

Case III



Ans-6 :→ (a) Yes, Mobile can acts a publisher. 0.5 marks

0.5 marks: publishers = 3 {Car, Temp. Sensor, Moisture sensor}
Subscribers = 4 {Mobile, Tablet, Computer, backend DB}

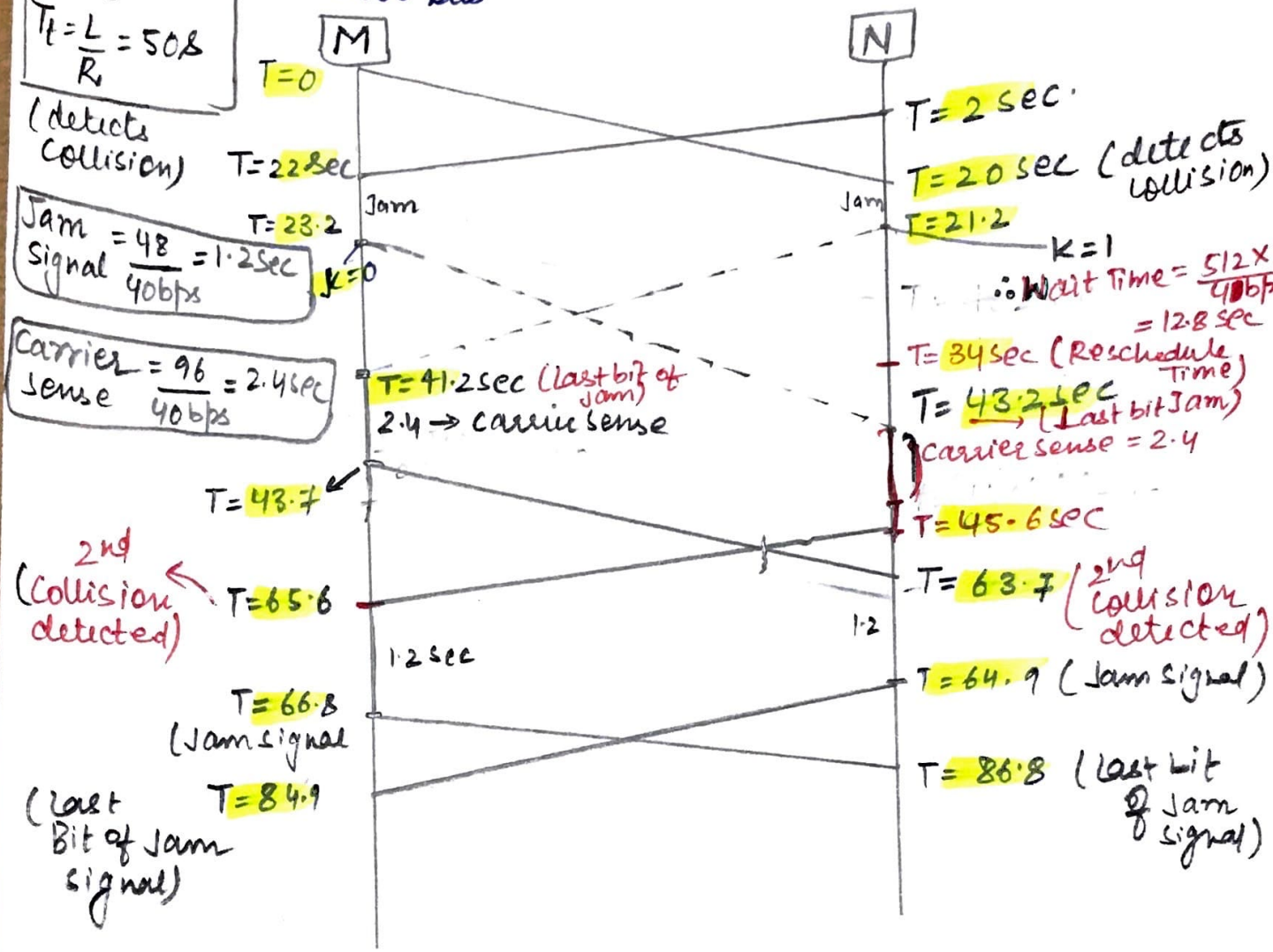
(b) Yes, Any device & application can be added to this model as Client. 1 mark

(c) Topics For Car speed & Temperature Sensor :→
(Speed 1) ex :→ (Speed / 70 mph)
(temp 1) ex :→ (temp / 50°C) 1 mark
MQTT Topics are Case Sensitive.

Ans-7 :→ a) b) c) } 2 marks each theory Answers.

Ans-4 :→ Two Stations :→ M and N
Distance = 2km, Speed = 100m/s, R = 40bps.
L = 2000 Bits

$T_p = \frac{d}{s} = 20s$
$T_t = \frac{L}{R} = 50s$



(a.) Minimum Frame Size = $L \geq 2 \times T_p \times R$ = 1600 bits. 0.5 mark
CSMA/CD Efficiency = $\frac{1}{1+5\times\frac{T_p}{T_t}}$ = 33.33%. 0.5 mark

(b.) M detects Collision = 22 sec. 0.5 mark
N " " = 20 sec. 0.5 mark.

(c.) N has Sent = (20-2) x 40bps = 18 x 40 bits = 720 bits 1 mark

(d.) Last bit of Jam. Signal Received at M => 41.2 sec 0.5 mark
" " " " " " N => 43.2 sec 0.5 mark

(e) Reschedule Time for M = 22.2 sec. 0.5 mark
N = 34 sec 0.5 mark

(f) Yes, Second collision is there. 0.5 mark.
M detects 2nd Collision = 65.6 sec } 0.5 mark
N " 2nd " = 63.6 sec }