POSSESION OF MOBILES IN EXAM IS UFM PRACTICE.

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

Jaypee Institute of Information Technology, Noida
T2 Examination, EVEN 2023
B. Tech. (CSE), VI Semester

Course Title: Computer Networks and Internet of Things **Maximum Time: 1 Hr.**
Course Code: 18B11CS311 **Maximum Marks: 20**

After pursuing this course, the students will be able to:
CO1: Defining the basics of networking components and underlying technologies
CO2: Illustrate the various key protocols in OSI model 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: Choose IP & MAC addressing mechanisms and data link layer protocols to solve communication, error detection and correction problems
CO6: Identification and description of various components, architectures and protocols of Internet of Things (IoT) and their real life problems

Note: Attempt all questions.

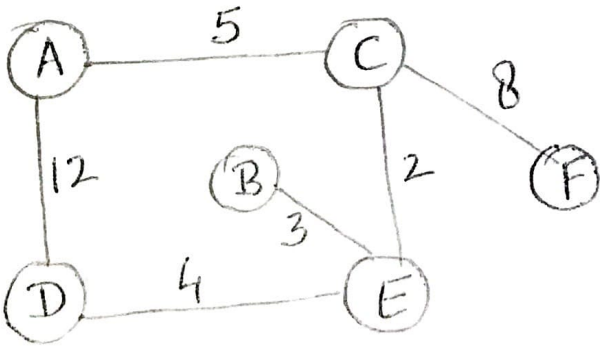
Q1. [CO3, CO4] Answer shortly:
(a) [CO4] [1 Mark] Which field of IP header is used to avoid infinite looping of a packet?
(b) [CO3] [1 mark] What will be the sender and receiver window size in case of selective repeat protocol if the 8 bits are used to represent the sequence numbers?
(c) [CO3] [1 Mark] What will be the value of RTO if a retransmission occurs? (Assume RTO = 3.75 ms)

Q2. [CO4] JIIT has the following chunk of CIDR based IP addresses available for distribution: **245.248.128.0/20.** The server manager wants to give half of this chunk of addresses to CSE department, and a quarter to ECE department, while retaining the remaining with himself for future purpose. Answer the following:
(a) Write the valid efficient CIDR allocation of IP addresses to CSE and ECE department. Also, mention the subnet mask in each case. **[2 Marks]**
(b) How many hosts are possible in both departments as CIDR allocated in (a) **[1 Mark]**
(c) Considering, the server manager used IP address from the reserve lot, what will be the broadcast address used by the server manager to send a common message to CSE and ECE department. **[1 Mark]**

Q3. [CO4] [4 Marks] A UDP application writes 2040 bytes of data and further by adding its header send to next lower layer. This data passes through a link with MTU as 576 bytes. Is there a need of fragmentation at the network layer? If yes, then how many fragments are required? Specify, length, offset, MF flag value for each fragment. Calculate the efficiency for sending the required data.

Q4. [CO3] Suppose TCP Tahoe sender "A" wants to send 20 KB file to "B". If, the MSS be 1 KB and CWND (Congestion window) is in slow-start phase initially with ssthresh 6. After exchanging initial sequence numbers between A and B, B announces RWND (Receiver window) size as 1 MSS. Subsequently, receiver window size received by the sender after transmission starts is 1, 2, 4, 2, 8, 5, 3, 1. Three ACKs events occur for segment 12 (Hint: CWND is 8). When 3 ACKs event occur, only the lost packet is retransmitted in the next round. As soon as the packet is received by the receiver, ACK is sent back. When there are back-to-back ACK's only the last ACKs are carrying advertisement of RWND size. Show the entire evaluation process of Congestion window as each segment is sent.
(a) [2 marks] What is the effective window size at the start of the transmission and at the time when 6^{th} packet is being sent by the sender?
(b) [2 marks] In which RTT (Transmission round) the retransmitted 12^{th} segment is being sent?
(c) [2 Marks] Suppose RTT value is 20 seconds, what would be the time when the last segment is being received at B?

Q5. [CO4][3 Marks] For the network below, using the link state algorithm, build the routing table for node D with syntax as (destination, distance, via which node). Assume all link state updates have been distributed.



Date: 05/04/23

Ans-1 :→ (a.) Time-to-live (TTL) field. 1Mark

(b.) Selective Repeat Protocol, $n = 8$

Sender Window Size = Reciever Window Size

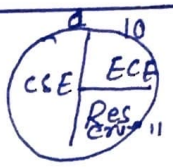
$\Rightarrow 2^{n-1} = 2^{8-1} = 128$. 1mark

(c.) If RTO = 3.75 ms

The Value of RTO is doubled for Each Retransmission

$\therefore$ RTO = 2 × 3.75 = 7.5 ms. 1mark

Ans-2 :→ IP Address → 245.248.128.0/20



Half Addresses to CSE

Quarter " " ECE

Remaining Reserved.

(a.) Valid CIDR Allocation :→

CSE | Subnet Mask :— 245.248.128.0/21 0.5mark

Range :→ 245.248.10000000.00000000

to

245.248.10000111.11111111

$\therefore$ 245.248.128.0 to 245.248.135.255 0.5mark

ECE | Subnet Mask :→ 245.248.128.0/22 0.5mark

Range :→ 245.248.100010 00.00000000

to

245.248.100010 11.11111111

$\therefore$ 245.248.136.0 to 245.248.139.255 0.5mark

*Note:→ can allocate small chunk first also

(b.) Number of Hosts :→ CSE → $2^{11} - 2 = 2046$ 1mark

EEE → $2^{10} - 2 = 1022$ 1mark

(c.) Direct Broadcast Address :→ 255.255.255.255. 1mark

Ans-3:→ Total Bytes to be Fragmented = 2040 + 8 bytes UDP Header
= 2048 bytes

MTU = 576 Bytes, 20 Bytes of Header

∴ Remaining 556 bytes of data.

∴ Fragmented into 4 pieces → 552, 552, 552, 392

Fragment No.	Length	Offset	MF
1	20+552 [0-551]	0	1
2	20 + 552 [552-1103]	552/8 = 69	1
3	20 + 552 [1104-1655]	1104/8 = 138	1
4	20 + 392 [1656-2047]	1656/8 = 207	0

∴ Efficiency = $\frac{\text{Useful Data}}{\text{Total Data (including Header)}} = \frac{2048}{2128} = 96.24\%$

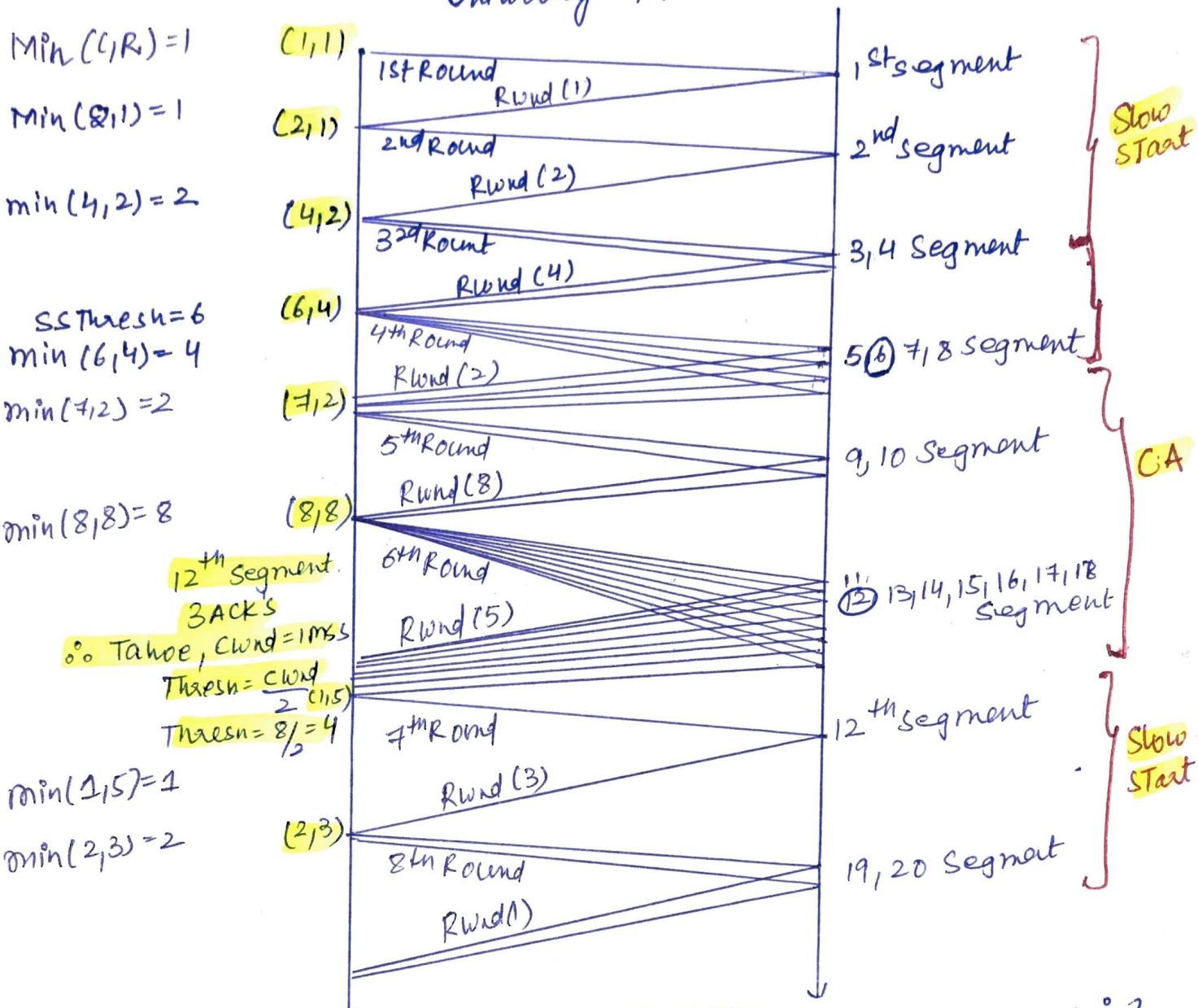
Ans-4 :→ A wants to Send 20 KB file to B.

MSS = 1KB

∴ TOTal TCP Segments = 20

∴ Window Size = min (Rwnd, Cwnd)

Initially (1,1) = 1



2 mark

(a.) effective Window Size min (1,1) = 1

" " min (6,4) = 4 { when 6th packet is being sent

2 mark

(b.) In 7th Transmission Round 12th segment is Retransmitted

2 mark

(c.) RTT = 20 seconds

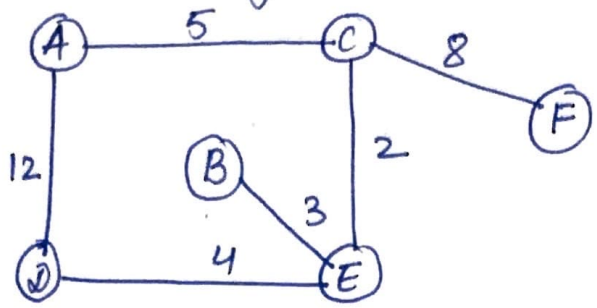
∴ RTT × 20 = 140sec + 20th Packet Sent in 8th Round

(one way Delay = 20/2 = 10)

∴ At 150sec Packet 20 is Received at B.

* Give marks if full Explained Window evolution

Ans-5 :→ Link State Algorithm



3marks

Routing Table for Node D :→

N	D(A), P(A)	D(B), P(B)	D(C), P(C)	D(E), P(E)	D(F), P(F)
D	12, D	∞	∞	(4, D)	∞
D, E	12, D	7, E	(6, E)		∞ 14, E
D, E, C	11, C	(7, E)			14, C
D, E, C, B	(11, C)				(14, C)
D, E, C, B, A					
D, E, C, B, F					

∴

Destination	Distance	Via Node
A	11	C
B	7	E
C	6	E
E	4	D
F	14	C