Q.1 How much time it will take to propagate all these messages (i.e., from M1 to M4) including all the computation and communication cost?

Ans:

Transaction → Vehicle to Block server communication

Provided Values

Cryptographic function	Keyword	Execution Time (in milliseconds)
AES encryption (Enc(Sk(x))	ENC	1.534
AES encryption (Drc(Sk(x))	DRC	1.834
SHA256	SHA	0.0083
XOR	X0	0.00012
Concatenation	CO	0.00015

Channel Size: 2Mbps or 250 bytes/millsec

Types of messages	Keyword	Size (in bytes)	Time in millisec (T)
Accident	M1	2	0.008
Traffic Jam	M2	5	0.02
Bad Road	M3	10	0.04
Construction site	M4	18	0.072

Computational Cost(CC)	Operations			Operation Time (O)	Total Operation Time (X)	Total Communication Cost (In milliseconds)
	Name	Count (C)	Value (V)	(C * V)	Sum of [C * V]	T * X
VCC (Vehicular Computational Cost)	CO	2	0	1.5423	9.8372	9.8452
	ENC	1	1.534			
	SHA	1	0.0083			
	X0	2	0			
RSU Computation Cost	DRC	1	1.834	3.3763		9.8572
	SHA	1	0.0083			
	CO	2	0			
	ENC	1	1.534			
Controller Computational Cost	CO	4	0	1.5506		9.8972
	SHA	2	0.0083			
	ENC	1	1.534			
Blockchain Server Computational Cost	ENC	1	1.534	3.368		9.9092
	DRC	1	1.834			

Q.2 What will be the storage requirement to store complete one transaction (including everything required to propagate the information in the network for each type of message?

Ans: Assuming that storage cost is not used for the channel used in message communication.

		Operations		**Total (bytes)**
	Name	Keyword	Count	
Vehicle	Variable	P	1	3
	Encryption	X	1	
	Hashing	Q	1	
RSU	Hashing	Q’	1	3
	Variable	Y	1	
	Encryption	Z	1	
Controller	Variable	M_{Info}	1	5
	Hashing	TH	1	
	Hashing	PH	1	
	Variable	BI	1	
	Encryption	W	1	
Blockchain Server	Encryption	S	1	1
Total				**12**

Types of messages	**Keyword**	**Size (S) (in bytes)**	**Total (T) [From above table]**	**Total Cost (Bytes)**
				S + T
Accident	M1	2	12	14
Traffic Jam	M2	5	12	17
Bad Road	M3	10	12	22
Construction site	M4	18	12	30

Q.3 If an accident happened at the bad conditioned construction road.

(a) How many messages are required to be communicated and what time it will take to transmit from vehicle to controller?

Ans: Based on the information provided in the question we would need 3 messages. M1, M3 and M4

(b) Also, explain which type of message will be transmitted first and why?

Ans: Delivery of messaged will be in order of M1 → M3 →M4, while the priority is M1 < M3 < M4.