

Q-1

Cryptographic functions -

1) Concatenation $\rightarrow 8$ (Con)

2) Hash(SHA256) $\rightarrow 4$ (H())

1.) $Q = \text{SHA256}(P)$, 2) $Q' = \text{SHA256}(P)$

3) $TH = \text{SHA256}(M_{info})$ 4) $PH = \text{Previous Block Hash}$

3) Encryption = 4 (Enc())

1) $X = \text{Enc}(K_k, P, Q)$, 2) $\text{Enc}(R_k(Y))$

3) $W = \text{Enc}(S_k(BI))$, 4) $\text{Enc}(S_k(BI))$

4) Decryption = 4 (Dec())

1) $\text{Dec}(X_k(X))$ 2) $\text{Dec}(R_k(Z))$

3) $\text{Dec}(S_k(W))$ 4) $\text{Dec}(S_k(S))$

Total Computation \Rightarrow

$$= 8\text{Con} + 4\text{H}() + 4\text{Enc}() + 4\text{Dec}()$$

$$= 8 \times 0.00015 + 4 \times 0.0083 + 4 \times 1.534 + 4 \times 1.834$$

$$= 13.5064 \text{ ms.}$$

Time to ~~process~~^{compute} one message $\rightarrow 13.5064 \text{ ms}$
for four message $\rightarrow 4 \times 13.5064$
 $= 54.0256 \text{ ms}$

channel capacity = 2mbps.

Time to communicate ~~see~~ message M_1 (2Byte)
= 1 sec.

from V_i to RSU.

Time to communicate message M_1 from V_i to
Blockchain Server \Rightarrow 3 sec.

Similarly. for message M_2, M_3, M_4 .

= 5 byte, 10 byte, 18 byte

= $2.5 + 5 + 6$

= 13.5 sec.

= $3 \times 13.5 \text{ sec.}$

= 40.5 sec.

Communication time to transmit all
four messages from V_i to Blockchain
Server \Rightarrow 43.5 sec.

total propagation time = $54.0256 \text{ ms} + 43.5 \text{ sec}$
= $43.554.0256 \text{ ms}$

or

= 43.554 sec.

Q.2 Storage Requirement of one transaction for each message.

for m_1 (2 byte).

from V_1 to RS_4

(m_1) , $X, T_1 \rightarrow 2+1+1 = 4$ byte.

from RS_4 to Controller

$(m_1), Z, T_2 \rightarrow 2+1+1 = 4$ byte.

Similarly

4 byte, ~~4 byte~~ from Controller to Blockchain server.

Thus - for $m_1 \rightarrow 4+4+4 = 12$ byte.

for $m_2 \rightarrow 7+7+7 = 21$ byte.

$m_3 \rightarrow 12+12+12 = 36$ byte

$m_4 \rightarrow 20+20+20 = 60$ byte.

Q.3 (9) 3 messages will be transmitted based on the message priority.

(m_1) First \rightarrow accident - (4 byte)

(m_3) Second \rightarrow Bad Road (36 byte)

(m_4) Third \rightarrow construction site (60 byte)

Time Required for transmission.

$$= 3 \times (2 \text{ sec} \times 9 + 18 \text{ sec} + 30 \text{ sec})$$

$$= 150 \text{ sec.}$$

(b) All the messages have priority. ~~But~~ the accident message (m_1) will be transmitted first because it has highest priority. Similarly based on decreasing priority message m_3 transmitted at second position & m_4 at the third position.