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Question # 1

a) Flow control is the management of data flow between computers or devices or between nodes in a network so that the data can be handled at an efficient pace.
While congestion control is a method used for monitoring the process of regulating the total amount of data entering the network so as to keep traffic levels at an acceptable value.
Flow control controls the traffic from a particular sender to a receiver while congestion control, controls the traffic entering the network.

b) Congestion & Flow control both are only used for connection-oriented networks. Because both of them wants to ensure that no data is being lost. Meanwhile connection-less doesn't care about data being lost. In Connection-oriented, Flow control uses the following techniques.

Stop-and-wait technique
Selective repeat

While congestion Control have one technique. When there is no acknowledgment received it will send few packets and exponentially increase the packets after time. Then when acknowledgment

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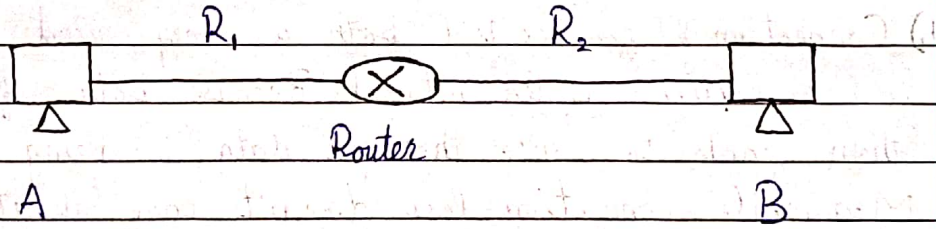
is received from some, it will linearly grow. And when no more packets are being accepted, then it will send constant number of packets.

c) Both are different. Flow control is used when only receiver is having problems with data acknoledging. Congestion control is used when network is having problem to transmit so much data. Flow control is used in data link layer and congestion control is used in network and transport layer.

Question #2



As we know that

$$\text{Transmission time} = \frac{\text{Length of Message}}{\text{Transmission Rate}}$$

$$= \frac{L}{R_1} + \frac{L}{R_2}$$

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Also we know that end-to-end delay depends upon speed.
Let suppose the speed from A to Router is S_1 and similarly the speed from Router to B is S_2. And let suppose the distance from A to Router is r_1 and distance from Router to B is r_2 so.

$$\text{Propagation delay} = \frac{r_1}{S_1} + \frac{r_2}{S_2}$$

So,

$$\text{end-to-end delay} = \frac{L}{R_1} + \frac{L}{R_2} + \frac{r_1}{S_1} + \frac{r_2}{S_2}$$

Question #3

Given data

$R_1 = 1200$ Kbs
$R_2 = 2$ Mbps
$R_3 = 5$ Mbps
$R_4 = 20$ Mbps
$R_5 = 5$ Mbps.

As we see from the above given data the minimum bandwidth is of R_1 i.e 1200kbps(1.2 Mbps) Even though every other bandwidth is higher

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which can be restricted by R_1, so the total throughput will be 1.2 Mbps.

Question # 5

Given data:

Frames in one minute = 10000

Frames in one second = 10000 = 60 sec

$$= 1 \text{ sec} = \frac{10,000}{60}$$

$$= 1 \text{ sec} = 166.6$$

So Frames in 1 sec = 166.6

Bits carried by each frame = 5000 bits

1 frame = 5000 bits

So,

166.6 frames = 166.6 × 5000

= 830,000 bits

So,

Total throughput = 830 kbps.

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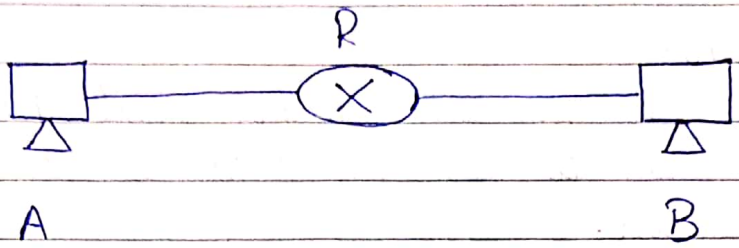
Question # 6



Possible delays are:

Transmission delay = $\frac{\text{Len of msg.}}{\text{Bandwidth}}$

Propagation delay = $\frac{\text{Distance}}{\text{Speed}}$

Delays in Router:

Queueing delay
Process delay

Total delay = Transmission delay + Propagation delay + Queuing delay + Processing delay.

Question # 7

It depends on the scenario that what we want to achieve. If we want high speed performance, then datagram will be used. If

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we want to get complete information, VC will be used.

VC scenario:

If we are sending mail then we don't want to lose any data so VC will be used.

Datagram:

If we are on a video call or watching some videos, it is fine to lose some data but we want to have a high speed connection.

Question # 8

Information is not provided completely !!