T6. (a) A — R1 — R2 - B

P3 P2 P1

P1 arrives R1 = 5ms + 10ms = 15ms

P1 leaves R1 = 15 + 50 = 65ms

P1 arrives R2 = 65 + 90 = 155ms

P1 leaves R2 = 155 + 5 = 160ms

P1 arrives B = 160 + 10 = 170ms

At 170ms, the first packet P1 arrives B.

(b) P2 arrives R1 = 5 + 5 + 10 = 20ms

P2 in queue = 65 - 20 = 45ms

P2 leaves R1 = 65 + 50 = 115ms

P2 arrives R2 = 115 + 90 = 205ms

∵ 205ms > 160ms

∴ now P1 was already left R2

⇒ P2 leaves R2 = 205 + 5 = 210ms

P2 arrives B = 210 + 10 = 220ms

P3 arrives R1 = 5+5+5+10 = 2

P3 in queue = 115 - 25 = 90ms

P3 leaves R1 = 115 + 50 = 165m

P3 arrives R2 = 165 + 90 = 255m

As ~~255~~ ms > 210ms

⇒ P3 leaves R2 = ~~255~~ + 5 = 260m

P3 arrives B = 260 + 10 = 270

The 3-rd packet arrive to B at 270ms

for each packet, total queueing delay: P1 = 0, P2 = 45ms, P3 = 90

total queueing delay = 45ms + 90ms = 135ms

⇒ average queueing delay (out of 3 packets) = $\frac{135}{3}$ ms

(C) P2 queueing: 65 - (20+S) = 0

P3 queueing: 115 - (25+2S) = 0

$\Big\}$ ⇒ S = 45ms

When the minimum S = 45ms, none of the packets will suffer any queueing delay in the middle.

YES. I think sender A can find a ~~p~~ suitable spacing in reality to prevent queueing delay in the middle.