Homework 12

Queuing

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Points: 20

For all questions, the approach used in your solution must be based on what was taught in the lecture videos. No other approach will be accepted. Otherwise, you will get many points deducted, up to and including receiving zero credit.

1. (10 points)

Suppose a congestion-control scheme results in a collection of competing flows that achieve the following throughput rates: 300 KBps, 150 KBPS, and 90 KBps. Calculate the fairness index for this scheme.

Round your answer to three decimal places.

N = 3

Numerator : (300 + 150 + 90) ^ 2 = 291600

Denominator: 3 \* (300^2 + 150^2 + 90^2) = 361800

Fairness Index = 291600 / 361800 = 0.806

1. Suppose a router has three input flows and one output. It receives the packets listed in the below table all at about the same time, in the order listed, during a period in which the output port is busy but all queues are otherwise empty. Give the order in which the packets are transmitted using the different types of approaches listed below. If there is a tie, go with the lower packet number (first column of the table).
2. (5 points)

Fair queuing.

1. (5 points)

Weighted fair queuing, with Flow 1 having weight 4, Flow 2 having weight 3, and Flow 3 having weight 5.

|  |  |  |
| --- | --- | --- |
| **Packet** | **Size** | **Flow** |
| 1 | 100 | 1 |
| 2 | 100 | 1 |
| 3 | 210 | 1 |
| 4 | 100 | 1 |
| 5 | 40 | 1 |
| 6 | 190 | 2 |
| 7 | 200 | 2 |
| 8 | 120 | 2 |
| 9 | 310 | 3 |
| 10 | 20 | 3 |

a.

Flow1:

flow1\_1 = max(0, A1) + P1 = 0+100 = 100

flow1\_2 = max(flow1\_1, A2) + P2 = 100 + 100 = 200

flow1\_3 = max(flow1\_2, A3) + P3 = 200 + 210 = 410

flow1\_4 = max(flow1\_3, A4) + P4 = 410 + 100 = 510

flow1\_5 = max(flow1\_4, A5) + P5 = 510 + 40 = 550

Flow2:

flow2\_6 = max(0, A6) + P6 = 0 + 190 = 190

flow2\_7 = max(flow2\_6, A7) + P7 = 190 + 200 = 390

flow2\_8 = max(flow2\_7, A8) + P8 = 390 + 120 = 510

Flow3:

flow3\_9 = max(0, A9) + P9 = 0+ 310 = 310

flow3\_10 = max(flow3\_9, A10) +p10 = 310 + 20 = 330

Order:

Packet 1, Packet 6, Packet 2, Packet 9, Packet 10, Packet 7, Packet 3, Packet 4, Packet 8, Packet 5

b.

Flow1:

flow1\_1 = max(0, A1) + P1/w = 0+100/4 = 25

flow1\_2 = max(flow1\_1, A2) + P2/w = 25 + 100/4 = 50

flow1\_3 = max(flow1\_2, A3) + P3/w = 50 + 210/4 = 102.5

flow1\_4 = max(flow1\_3, A4) + P4/w = 102.5 + 100/4 = 127.5

flow1\_5 = max(flow1\_4, A5) + P5/w = 127.5 + 40/4 = 137.5

Flow2:

flow2\_6 = max(0, A6) + P6/w = 0 + 190/3 = 63.33

flow2\_7 = max(flow2\_6, A7) + P7/w = 63.33 + 200/3 = 130

flow2\_8 = max(flow2\_7, A8) + P8/w = 130 + 120/3 = 170

Flow3:

flow3\_9 = max(0, A9) + P9/w = 0+ 310/5 = 62

flow3\_10 = max(flow3\_9, A10)+P10/w = 62 + 20/5 = 66

Order:

Packet 1, Packet 2, Packet 9, Packet 6, Packet 10, Packet 3, Packet 4, Packet 7, Packet 5, Packet 8