University of Central Florida

Department of Computer Science

CDA 5106: Fall 2020

Machine Problem 3: Dynamic Instruction Scheduling

by

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Honor Pledge: "I have neither given nor received unauthorized aid on this test or assignment."

Student's electronic signature: ____Dhrubo Hasan Chowdhury_____
(sign by typing your name)

Answer to question 1:

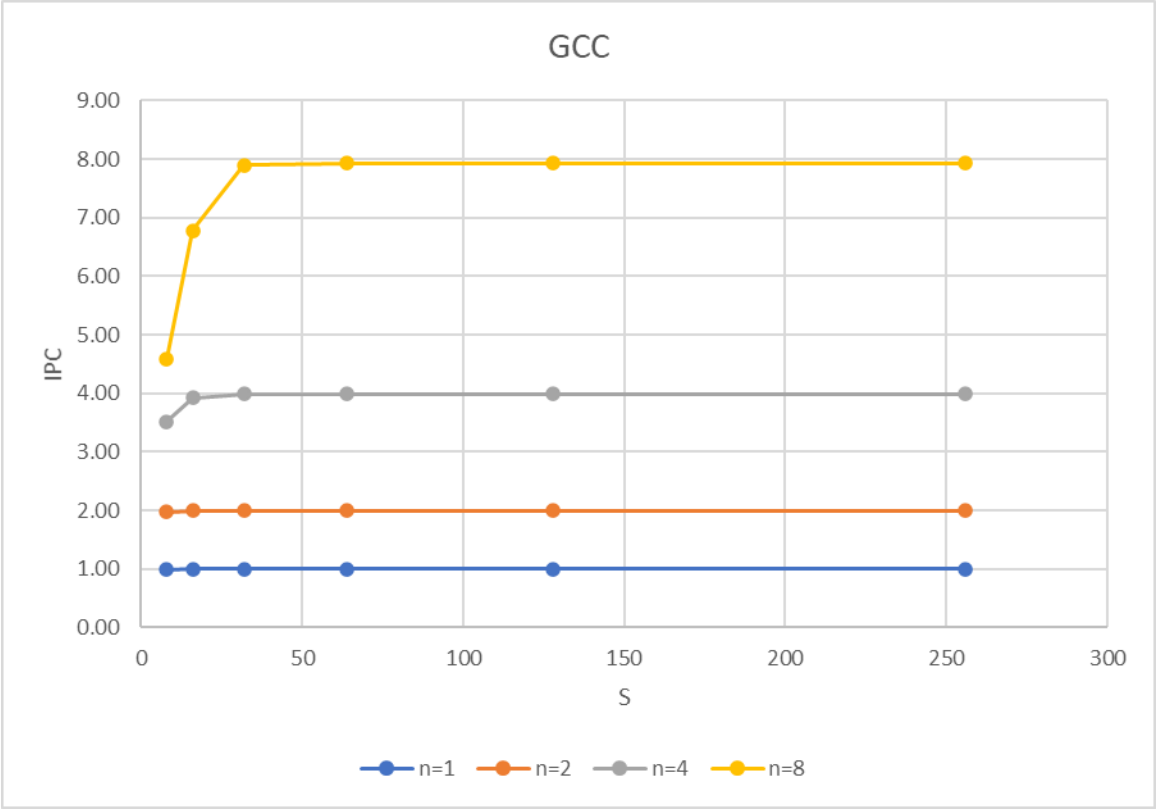

Figure 1: IPC vs S for different N (GCC)

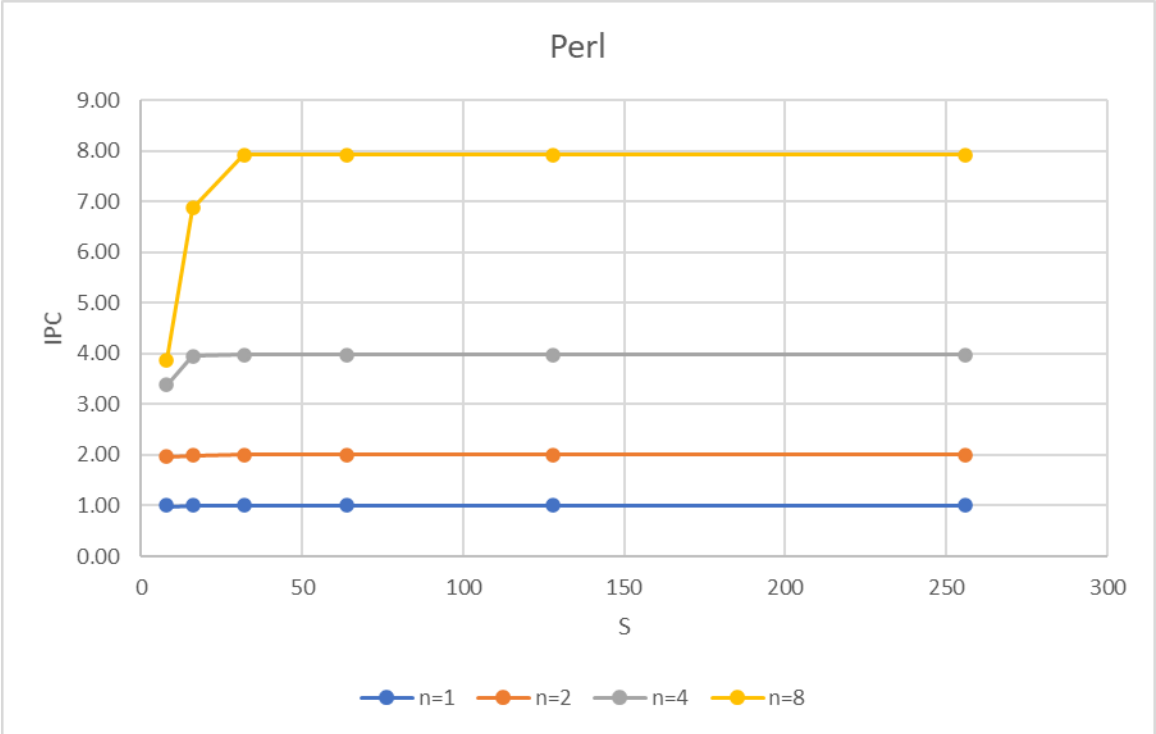

Figure 2: IPC vs S for different N (Perl)

Answer to question 2:

Optimized Scheduling Queue size per peak fetch rate		
	Benchmark = gcc	Benchmark = perl
N = 1	8	8
N = 2	8	8
N = 4	13	14
N = 8	27	25

Answer to question 3a:

After careful investigation of the above graphs, we find that IPC saturates at the peak fetch rate after a specific value of the scheduling queue size given a fixed N value.

From our graph, when we are using N = 1 and N = 2, we get the peak fetch rate asymptote right from the beginning (S = 1).

For N = 4 and N = 8, IPC starts at a very low value compared to peak fetch rate. As, we increase S, we get better results for fulfilling the actual purpose of superscalar processor.

So, in conclusion, we can say that, IPC changes almost irrespective of S for smaller N sizes, and for larger N sizes, we observe some slope in the beginning, but it asymptotically reaches peak fetch rate at some point irrespective of the S size.

Answer to question 3b:

In my analysis, IPC is not strongly dependent on the benchmark. It varies only slightly, but that small variation could be because, different benchmarks have arranged their instruction orders and dependencies differently. So, it is not expected to have exactly same IPC for different instruction sets and thus for different benchmarks, but we do see the pattern of IPC saturating at peak fetch rate given enough scheduling queue size as input for all benchmark.