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CPEN 411 PS#1

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Problem 1

(a)

Assuming A1 takes T1 time  
>> On single core:  
45%A1 takes 45%T1  
55%A1 takes 55%T1

>> On dual core:  
45%A1 takes (45/2)%T1  
  
>> Therefore overall after 45% parallelization:  
TP1 = 22.5%T1 + 55%T1 = 77.5%T1  
=> T1/TP1 = 100/77.5 = 1.29x speedup

(b)

>> Similarly we have:  
TP2 = (97/2)%T2 + 3%T2 = 51.5%T2  
=> T2/TP2 = 100/51.5 = 1.94x speedup

(c)

>> Overall time when first application is parallelized (OTP1) in terms of overall time with no parallelization(OT):  
OTP1 = 77.5% \* 70%OT + 30%OT = 84.25%OT

=> OT/OTP1 = 100/84.24 = 1.19x speedup

(d)

>> Overall time when second application is parallelized (OTP2) in terms of overall time with no parallelization(OT):  
OTP2 = 70%OT + 51.5% \* 30%OT = 85.45%OT

=> OT/OTP1 = 100/85.45 = 1.17x speedup

(e)

Problem 2

(a)

>> Similar to problem 1 we solve the problem as follows:

TP = 10%T + (90/200)%T = 10.45%T  
=> T/TP = 100/10.45 = 9.57x speedup

(b)

>> Working backwards from the above cases:

T/TP = 1000x

=> TP = x%T + ((100-x)/inf)%T = 0.1%T (inf since we can run the parallelized code infinitely fast)

=> x = 0.1

At least 99.9% must be parallelized

(c)

>> Similar to part (b) but now solving for n:  
TP = 0.03%T + (99.97/(n \* 200))%T = (1/2000)T

=> n = 25 (minimum)

Problem 3