## COMP9334 Revision Questions for Week 8A

### Question 1

Consider a composite web service which makes use of three web services. You can model this as a fork-join queue with 3 servers. Assuming that all the 3 servers have exponentially distributed service time with mean service rate $\mu$. Assuming also that the service time distributions at all servers are independent. We showed in the lecture, by using Markov chain that the mean service time of the fork-join queue is given by

$$(1 + \frac{1}{2} + \frac{1}{3})\frac{1}{\mu} \tag{1}$$

In this question, you will derive the same result using probability distribution.

(a) What is the probability that the service time of the fork join queue is less than $x$? (Hint: If the service time of the fork join queue is less than $x$, it means that the service time at each server must also be less than $x$.)

(b) You have in fact derived the cumulative probability density in Part (a). Find the probability density of the service time of the fork join queue.

(c) Using your result in Part (b), find the mean service time at the fork join queue.

Remark: An interesting exercise is to do that for $n$ servers. I leave it to you.