Quiz 5 — Spring 2024

- Due Apr 23 at 11:59pm
- Points 6
- Questions 6
- Available after Apr 18 at 12am
- Time Limit None
- Allowed Attempts Unlimited

Instructions

This quiz is the last one for the semester. See Practice Quiz 5 for examples of what this quiz covers.

The quiz is due on the last day of instruction, Tuesday, April 23, at 11:59 pm Eastern Time. You have unlimited attempts.

Take the Quiz Again

Attempt History

	Attempt	Time	Score
LATEST	Attempt 1	14 minutes	6 out of 6

Correct answers will be available on Apr 24 at 12am.

Score for this attempt: 6 out of 6
Submitted Apr 20 at 9:44am
This attempt took 14 minutes.

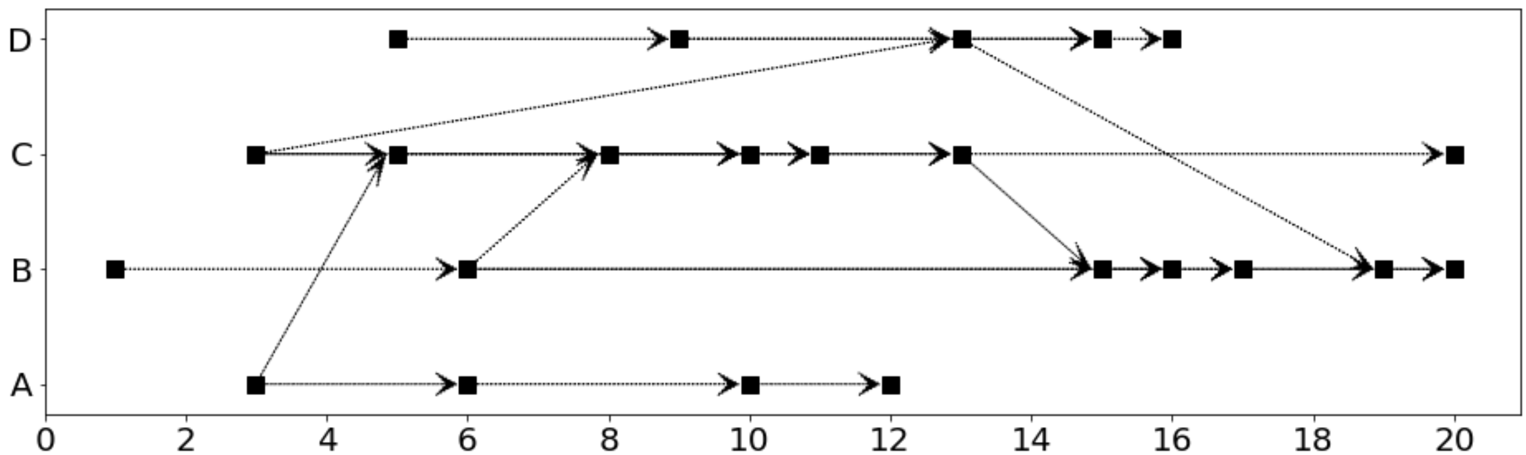
Question 1
1 / 1 pts
Consider the execution of a butterfly barrier among 16 logical processes, numbered 0 through 15. Recall that during the first logical step, or "round," of exchanges, process 0 exchanges with process 1, process 2 with 3, and so on. During the third logical step or round, which logical process will exchange information with logical process 9?

13

Question 2

1 / 1 pts

Consider a parallel discrete-event simulation whose event-dependency DAG (directed acyclic graph) is as follows:



In this picture, there are four logical processes ('A' through 'D'), each corresponding to a y-axis value. The x-axis is logical simulation time. Each solid square is an event, shown at its logical timestamp. An edge going from the event 'u' to event 'v' indicates that 'v' depends on 'u'.

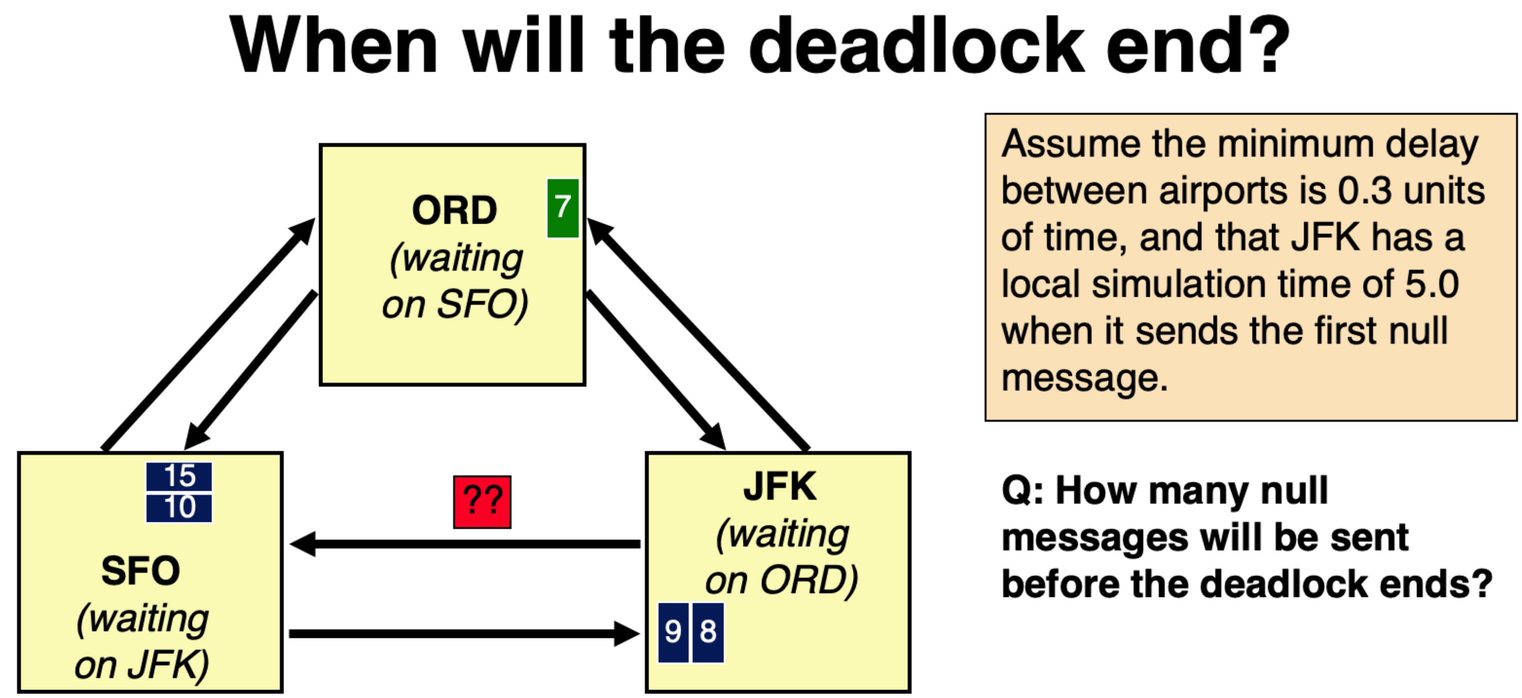
What is the **average available parallelism** (or just "**average parallelism**") in this DAG? Round your answer to the first decimal place, e.g., "7.32" becomes "7.3" and "7.35" becomes "7.4".

2.1

Question 3

1 / 1 pts

Recall the multi-airport simulation model, as illustrated below: there are three airports, JFK, SFO, and ORD. The simulation has been running, and eventually reaches the state shown in the figure below, where a deadlock has occurred because JFK is waiting for messages from ORD, SFO from JFK, and ORD from SFO.



To resolve the deadlock, suppose we run the Chandy/Misra/Bryant null message algorithm. Assume that the minimum logical (simulation) time delay to travel between any two airports is 0.3 time-units. How many null messages will be sent before the deadlock can end? Assume that JFK starts at logical (simulation) time 5.0 time-units and that it sends the first null message.

8

Question 4

1 / 1 pts

Suppose your simulation produces a single number as its output. Further, suppose that the simulation uses randomness, so we can treat its output as a random variable.

You run 8 independent trials of your simulation, obtaining the following outputs in these trials:

> 0.489, 0.247, 0.364, 0.127, 0.373, 0.077, 0.44, 0.738

Compute a **95% confidence interval** about the sample mean of these trials, and report **either** the lower bound **or** the upper bound accurate to 2 decimal places. *(That is, suppose you determine the confidence interval to be (0.2038, 1.475). Then you would enter either 0.20 or 1.48 in the box below.)*

0.17

Question 5

1 / 1 pts

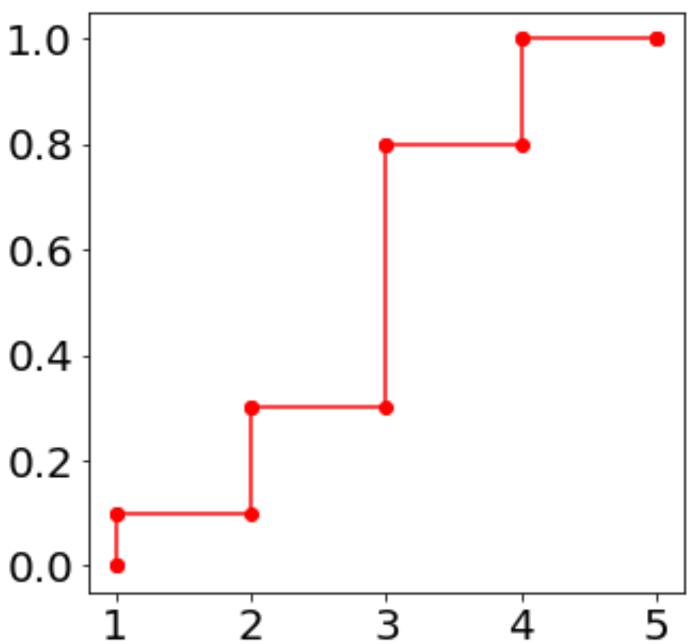
Which of the following is a desirable attribute of a pseudorandom number generator? Check all that apply.

- [x] The PRNG passes a battery of statistical tests of randomness
- [x] The PRNG is portable across machines
- [x] The PRNG is fast and does not require a lot of memory
- [x] The PRNG can be used to produce independent streams of random numbers
- [ ] The PRNG has a short period
- [ ] Calculating sample autocorrelations on a sequence generated by the PRNG yields large lag-coefficients

Question 6

1 / 1 pts

Consider an integer random variable whose sample space consists of the possible values 1, 2, 3, 4, or 5. Suppose the empirical cumulative distribution function (ECDF) is as follows:



Now suppose we wish to create a random variate that is consistent with this ECDF. Assume that we use the "inversion" technique described in class, i.e., first invoke a uniform variate to get some value u and then "invert" this ECDF at u to get a sample value. If we call this random variate 10 times, approximately how many times would we expect to see the value of 5?

0

Quiz Score: 6 out of 6