Mid-Term Exam for Advanced Operating Systems
Spring 2019

Name:_____ Score:_____
ID:_____

This is a TAKE-HOME exam. You may refer to any materials to answer the questions. You are **NOT** allowed to discuss the answer with your classmates and TA. Any plagiarism will be considered as cheating. You may need to read the provided reference to answer questions. Answer all the questions in a separate sheet and submit your answer on ceiba website.

(1) You can answer the question in English or Chinese.
(2) The submission must be a PDF file.
(3) **Do not submit a scanned hand-written answers.**
(4) The number of pages should NOT exceed 6 pages, on 12 points single space A4-size paper.
(5) Student ID and name must be shown on the first page.
(6) No need to repeat the questions on your answer sheet.

Release Date: 2:20PM, April 25th, 2019.
Due Date: 2:20PM, April 26th, 2019. (NO late submission)

Reference materials are available on course website.

No.	Full Credits	Earned Credits	Graded TA
1	20		
2	20		
3	30		
4	20		
5	10		
Total	100		

1. (20 points) Please compare lazy consistency model with **release consistency** model and **weak consistency** model. (Pete Keleher, Alan L. Cox, and Willy Zwaenepoel. 1992. Lazy release consistency for software distributed shared memory. SIGARCH Comput. Archit. News 20, 2 (April 1992), 13-21.) HINT: you should discuss the pros and cons of three models, including number of messages to maintain consistency when there are *n* shared variables, programmability, number of synchronization, etc.

2. (20 points) Customized operating systems can optimize the performance of special purpose systems and reduce the size of operating systems at the same time. Please (1) compare micro-kernel and UniKernel when they are used for customization in distributed systems and (2) describe one right use scenario for each of these two operating systems and discuss them.

3. (30 points) Please write the pseudo-code for dynamic distributed-server algorithms to update block table on each node. You should take into account initialization, table update, owner query, copy-set query, and fail recovery.

4. (20 points) One major concept of 5G is Virtualized Network Function, which migrates the network services from the core of the network to the edge of the network. Please argue and compare the ***active message mechanism*** proposed by Eicken et. al in 1992 in terms of the capability of reducing the overhead of moving data between service providers and users.

5. (10 points) The following figure shows the legal sequence of read/write operations among three nodes sharing a distributed shared memory. Please answer the two questions.
   (a) Which consistency model does the system support?
   (b) Please revise the sequence so that it meets the requirements of sequential consistency model.