

Master of Computer Science & Engineering 1st Semester Examination 2017

ADVANCED OPERATING SYSTEMS

Time: 3 hours

Full Marks: 100

Answer any four questions from the following

(All parts of the same question must be answered together)

1.

- a. Suppose you are asked to design a kernel for a new operating system. List the features from monolithic kernel and microkernel that you want to have. Justify your answer.
- b. What is the layout of Unix file system? Mention the contents of each.
- c. How are the addresses of a file stored in an inode? Give an idea of the maximum file size that can be obtained using the approach in Unix.
- d. What information does buffer header contain? How can a buffer belong to both hash queue and free list simultaneously?

6+6+6+(4+3)=25

2.

- a. What are the differences between the contents of disk inode and in-core inode? Why are additional information required in in-core inode?
- b. How is context of a process saved in Unix?
- c. What are the *regions* and how are corresponding information maintained? Is it possible for more than one processes to share a user-written routine? Justify your answer.
- d. Explain the Unix process state diagram (with two modes).

(4+3)+5+(4+3)+6=25

3.

- a. What is an *immutable* file? What are the advantages and disadvantages of *stateless* system? Where can files be cached in distributed file systems?
- b. How is write/append action executed in OSF Distributed File System?
- c. What is Server Message Block (SMB)?
- d. How is Google File System (GFS) implemented? Explain with reference to the architecture.

(1+4+3)+4+3+10=25

4.

a. Consider the following categories (P and Q) of periodic tasks with their characteristics: (No explicit priority among the task categories are assumed.)

Process	Arrival time	Execution time	Deadline (ending)
P1	10	15	35
P2	30		55
P3	50		75
P4	70		95
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Process	Arrival time	Execution time	Deadline (ending)
Q1	10	20	40
Q2	40		70
Q3	70		100
Q4	100		130
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Assuming nonpreemptive strategy, draw up a schedule for the above tasks. Justify your answer.

b. Assuming preemptive strategy, draw up a schedule for the above tasks. Justify your answer. How does the assumption in (a) and (b) affect the scheduling?

c. Now consider two aperiodic tasks X and Y with the following characteristics:

Process	Arrival time	Execution time	Deadline
X	50	10	80 (ending)
Y	60	20	80 (starting)

Are you able to accommodate X and Y in the schedules set up by you as answers to above (a) and (b)? Clearly state the assumptions that you may take for setting up an appropriate schedule to accommodate all P and Q tasks along with X and Y. Show the schedules: (i) schedule at (a) with X and Y and (ii) schedule at (b) with X and Y. Justify your answer.

$$8+(8+3)+6=25$$

5.

- a. What does a *gap-free sequencer* do? How does it help in assuring data consistency? What may be the problem with such sequencer?
- b. How does Read-Replication algorithm improve system performance? How can data *write* be achieved in such a system?
- c. What do the components of a *load distributing algorithm* indicate?
- d. Explain the working of Stable Sender-Initiated algorithm and hence comment on the type of task transfer that would occur in this algorithm.

$$(3+2+2)+(3+2)+5+8=25$$

6.

- a. What advantages does buffer cache offer? Suppose a referenced data block is not found in buffer cache. What different scenarios will occur in such a situation? Mention the probable solutions.
- b. What are the threading models? Suppose a multithreaded program is to be executed in a multiprocessor system that does not support kernel level threads. What problems, if any, will arise in the execution?
- c. Why is Android operating system so popular? How are processes executed in Android? Which libraries are supported by Android? Mention some core applications supported by Android.

$$(2+5)+(4+2)+(2+4+3+3)=25$$
