

## M. Tech Computer Technology First Year Second Semester Examination 2018

## ADVANCED OPERATING SYSTEM

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. What are the characteristics of Microkernel based operating system architecture? Provide the Microkernel block diagram. What are the benefits of Microkernel? How can the performance issue of Microkernel be addressed?
  - b. How does Monolithic kernel implement operating system (OS) services? Mention any two OS services. What are the disadvantages of Monolithic kernel? In which address space does Mac OS allow servers to be loaded dynamically?
  - c. What does the *boot block* of Unix file system contain?

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

2.
  - a. Show the interrelationships among the different subsystem modules of Unix using the Unix system kernel architecture block diagram.
  - b. What are the contents of *Superblock* in Unix? How is the kernel notified that *superblock* has been modified?
  - c. What happens after the *fork* system call? What support is provided by kernel to a newly created process? "Pointers from *per process region table* are directed to *kernel region table*". Is the sentence correct? Justify your answer.

 $10+(3+2)+(3+4+3)=25$ 

3.
  - a. What issues are faced while implementing *distributed shared memory* (DSM)? What are the problems with *Central Server DSM* algorithm?
  - b. What is understood by: *general consistency*, *processor consistency*?
  - c. What are the advantages of *Migration DSM* algorithm?
  - d. How is *Wait For Graph (WFG)* constructed? Why is detection of deadlock a problem in distributed systems? How does the *One-phase centralized distributed deadlock* detection algorithm work?

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

- 4.
- In the *load sharing approach* of thread scheduling, how can a *local run queue* as well as a *global run queue* coexist?
  - What is *gang scheduling*? Suppose there is a 4-processor system with 3 jobs, where job1 has 4 threads, job2 has 3 threads and job3 has 2 threads. Compare the Gang scheduling approach with (i) uniform division and (ii) Weighted division.
  - Using *dynamic scheduling* how is a newly arrived job scheduled when there are no idle processors? What problem will arise when the number of active threads is more than the number of processors in *dedicated processor assignment* scheduling?
  - What are the scenarios when the kernel cannot find the disk block in the hash queue of buffer cache? How are these scenarios handled?

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

- 5.
- Consider the following execution profile of five aperiodic processes. Develop a scheduling strategy and find out whether all processes could be executed successfully under the following conditions: i) Preemption is allowed where Priority of P2 is highest followed by priority of P4, followed by priority of P1, followed by priority of P3, and P5 having lowest priority. Give reasons for your answers regarding the scheduling approaches adopted by you.

Process	Arrival time	Execution time	Deadline
P1	10	15	50 (ending)
P2	20	10	50 (starting)
P3	25	25	80 (ending)
P4	40	10	80 (starting)
P5	50	20	100 (ending)

- What is the *static table driven approach* of real-time scheduling? When is it advantageous to use and why?
- What are the assumptions in Rate Monotonic Scheduling (RMS)? Consider the following information of four processes and find using RMS whether they are schedulable.

Process	Execution time	Periodicity
P1	10	30
P2	20	50
P3	25	75
P4	10	60

$$10+(3+3)+(3+6)=25$$

6.

- a. What is the difference between load *sharing* and load *balancing*? What are the different types of *Information policy*? Under what circumstances is it advantageous to use *Receiver initiated load sharing* algorithm and why?
- b. What is the working principle of the *Above Average algorithm*? Why may the *Above Average algorithm* sometimes require a change in load estimate of nodes?
- c. What data structures are used in *Stable Sender-initiated algorithm*? What is the utility of maintaining the *state vector* at each node?

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

7.

- a. Compare stateful vs stateless system.
- b. What is the *Remote access model* in Distributed File Systems? Mention its advantages and disadvantages.
- c. What are the components of *Google File System (GFS) cluster*? How is *reliability* achieved in GFS?
- d. How does *writing* happen in GFS? What are the other functions of GFS?
- e. What does *thread control block* contain?

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

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