Roll Number: _____

Thapar University Patiala

Computer Science & Engineering Department

B.E 3rd Yr. 1st Semester CSE, CML, CAG, SE

EST, 6th December 2016

UCS303: Operating System

Maximum Marks: 100

Time: *3 Hrs.*

Name of Faculty: ***Vinay, Jhilik, Tarunpreet, Tamanna***

Note: All Questions are Compulsory; Attempt in a **sequential order;** Draw diagrams to support the explanation; Assume missing data (if any).

Q.1
a) Explain Bootstrapping and System Call. 3
b) Peterson's solution is supposed to give a good solution for two process synchronization. With a suitable example code, explain the logic embed in it. 5
c) Diagrammatically explain RAID 1 and 1+0 structure. 5

Q.2
a) With a suitable depiction, explain the variety of operations that are feasible on the access matrix. 6
b) List any two types of threats by which a program may cause the security breaches. 4
c) In a system, the following state of processes and resources are given: 5

$$R1 \rightarrow P1, P1 \rightarrow R2, P2 \rightarrow R3, R2 \rightarrow P2, R3 \rightarrow P3,$$
$$P3 \rightarrow R4, P4 \rightarrow R3, R4 \rightarrow P4, P4 \rightarrow R1, R1 \rightarrow P5$$

Draw a suitable resource allocation graph (RAG).

Q.3 The host OS say Windows Vista is having VMWare or Virtual box installed on it and guest OS is Windows XP. Consider an application X on the guest OS. List the various available modes for an application X when it started execution with a demand of underlying hardware and become idle sometimes. 5

Q.4
a) Three processes P1, P2 and P3 of size 21900, 21950 and 21990 bytes, respectively, need space in the memory. If equal-sized partitions of 22000 bytes are allocated to P1, P2, and P3. With a suitable illustration comment on the type of the fragmentation (with fragment(s) size in bytes) that exists in this allocation strategy? 3
b) In a paging scheme, 16-bit addresses are used with a page size of 512 bytes. If the logical address is 0000010001111101, how many bits are used for the page number and offset? Compute the page number and offset (in binary as well as in decimal format) as well. What will be the physical address (in binary), if the frame address corresponding to the computed page number is 15 (decimal). 7
c) A process of size 200 MB needs to be swapped into the hard disk. But there is no space in memory. A process of size 250 MB is lying idle in memory and therefore, it can be swapped out. How much swap time is required to swap-in and swap-out the processes if: average latency time of hard disk is 10ms and transfer rate of hard disk is 60MB/s 5

Q.5 For the following reference string: 10

5, 0, 2, 1, 0, 3, 0, 2, 4, 3, 0, 3, 2, 1, 3, 0, 1, 5

Diagrammatically explain and compare the number of page faults that occur with optimal page replacement and least recently used page replacement algorithm. Consider the count of frames available in the RAM as three. Also, assume that frames are initially free.

Q.6 Consider a disk queue with I/O requests on the following cylinders in their arriving order: 10

6, 10, 12, 54, 97, 73, 128, 15, 44, 110, 34, 45

The disk head is assumed to be at Cylinder 23 and moving in the direction of decreasing number of cylinders. The disk consists of total 150 cylinders. Calculate and show with diagram the disk head movements using SCAN and LOOK algorithms.

P.T.O

Q.7 a) With the help of suitable diagram, compare and contrast contiguous, linked and indexed disk allocation strategies. 6

b) A file system uses 512-byte physical blocks and block numbering starts from 1. Now, assume that the last physical block read and the directory entries (corresponding to contiguous, linked and indexed strategies) are residing in the main memory. Further, assume the directory entries in indexed allocation contain pointers for 127 file blocks with an additional pointer to the next index block. In addition to the last block read, assume that the index block that contains pointer to the last block read resides in the main memory. Indicate with proper justification that how many physical blocks must be read for the cases given below in context of contiguous linked and indexed allocation. 6

i) Last block read: 200; block to be read: 50
ii) Last block read: 150; block to be read: 500
iii) Last block read: 127; block to be read: 128
iv) Last block read: 129; block to be read: 128

Q.8 a) Consider a demand-paged virtual memory system consisting of a TLB with access time of 200ns, a main memory having access time of 400ns and a disk backing store. References that result in page faults require 10ms if the page to be replaced has been modified, 5ms otherwise. If the page fault rate is 5%, TLB hit rate is 65%, and 40% of replaced pages are dirty, what is the effective access time (in microsecond)? Assume the system is running only a single process, and the CPU is idle during page swaps. 5

b) With a suitable pseudo-code for the atomic operation available, explain Semaphores and its utility significance. 5

Q.9 a) Write an algorithm for detecting deadlock for multiple instances of resources. Consider a system with the following information and determine whether the system is in deadlock situation? **Total instances** for resources R1, R2 and R3 are 5, 6, and 4 respectively. 7

Process	Allocation			Request		
	R1	R2	R3	R1	R2	R3
P1	1	0	2	1	0	0
P2	1	1	0	4	0	2
P3	1	1	0	0	1	2
P4	0	2	1	2	1	0
P5	1	2	0	3	1	4

b) In continuation of Q9a, if the process P4 request an additional instance of resource R2. Find out whether the system is deadlock free? 3

Note: Schedule for seeing evaluated answer sheets is TAN Block T101, 19th December 2016

COE G1	*10:00am*	***COE G3***	*12:00noon*	***CAG***	*1:45pm*
COE G2	*11:00am*	***CML***	*1:00pm*	***SEM***	*2:30pm*