EX/CSE/T/322/62/09

BACHELOR OF COMPUTER Sc. ENGINEERING EXAMINATION 2009

(Third Year, Second Semester)

OPERATING SYSTEMS

Full Marks : 100

Time : Three hours

Answer Question no.1 and any **four** from the rest

1.

a. Explain any three necessary conditions of deadlock.

b. What are the advantages of segmented memory allocation?

c. Define waiting time, seek time.

d. Explain whether the following is true or not: A process may continue its execution immediately after the event it has been waiting for happens.

e. What is thrashing? How can it be detected? What method may be adopted to get rid off thrashing once it is detected?

6+3+4+2+5

2.

a. Consider a file currently consisting of 50 blocks of information. Assume that the file control block (and index block, in the case of indexed allocation) is already in memory. Calculate the number of disk I/O operations required for **contiguous, indexed** allocation strategies to make the following changes to the file. For contiguous allocation, assume there is no space to grow in the beginning, but the file may grow at the end. Assume that the new information to be added to the file is stored in memory. i. Add a block at the beginning of the file, ii. Add a block at the end of the file

b. What are the problems faced in linked file allocation strategy? How is it overcome in indexed allocation strategy?

c. How is free disk space managed using *counting* technique?

d. Disk requests come into the disk driver for cylinders 105, 23, 118, 11, 38, 114 in that order. A seek takes 3 msec per cylinder move. What is the total seek time to access all blocks for the following disk scheduling policies: (i) Shortest Seek Time First and (ii) C-SCAN (initially going down from cylinder 199 towards cylinder 0). In all cases disk arm is initially at cylinder 100. Assume the disk arm flies back to cylinder 0 at a rate of 1.5 msec per cylinder.

4+(2+3)+3+8

3.

a. Consider the following page reference during a given time interval: v, w, u, x, v, w, z, v, w, u, x, z for a memory consisting of i. 3 frames and ii. 4 frames. Using First In First Out page replacement strategy show the contents of memory and comment on the results.

b. Assume a task to be divided into 5 equal-sized segments and the system (using paged segmentation) builds an 8-entry page descriptor table for each segment. Assume that page size is 3Kbytes.

i) What is the maximum size of each segment?

ii) What is the maximum logical address space of this task?

c. What is TLB? Find out the effective memory-access time with 90% hit ratio and the following access times:

TLB access time: 15ns; MM access time: 95ns

(2X4+2)+4+(3+3)

4.

a. Differentiate between synchronous and asynchronous message passing. Will you be able to emulate asynchronous message passing using synchronous message passing? Justify.

b. Mention the condition under which the following transition would occur in a process state diagram. (i) Run to Ready (ii) Run to Blocked

c. Consider the following set of processes:

Process	Arrival Time	Processing time
A	0	3
B	2	6
C	4	4
D	6	5
E	8	2

Compute the average turnaround time and individual waiting times and individual turnaround times using the following scheduling policy: Round Robin with time quantum = 4 units. Show the Gantt chart.

(3+3)+4+10

5.

a. In a single-CPU system a large number of tasks with unknown computation times are to be executed. Which scheduling strategy would you choose to minimize the average turnaround time? Give reasons for your answer. Assume task switching delays to be short.

b. What is the difference between deadlock prevention and deadlock avoidance? What problems will arise if we allow preemption to prevent deadlock?

c. N processes M resource units that can be reserved and released only one at a time. The maximum need of each process does not exceed M and the sum of all maximum needs is less than M+N. Can deadlock occur in such a system? Justify.

d. What is the concept of Multilevel Feedback Queue scheduling?

4+(4+4)+5+3

6.

a. Consider the following processes A, B, C with their associated codes. Assume that all semaphores have been created before and have initial value 1. fork(X) means process X is created and ready to execute. These processes are executing on a single CPU using preemptive priority scheduling strategy. Initially process C is created. The priorities are: A:3, B:2 (lowest), C:4 (highest)

Process A: A1; P(sem1); A2; P(sem2); V(sem2); A3; V(sem1)
Process B: B1; P(sem2); B2; fork(A); V(sem2); B3
Process C: C1; P(sem1); C2; C3; V(sem1); C4; fork(B)

Partial execution trace: 1. C1: 2. P(sem1); 3. C2; 4. C3, 5.....
Indicate the execution trace and explain (also show) when a process is blocked, when a process is woken up

b. What is access matrix?

c. What are the advantages of using threads over processes? Identify the type of thread and explain the following: Blocking (due to system call) occurs at the thread level and not at the process level.

10+3+(3+4)

7.

a. What is super block?
b. What are the contents of in-core inode?
c. What are buffer caches? How are these buffers arranged?
d. How would the following file be opened in Unix: /usr/bcse/bcse3/text ?
e. What is u-area?

3+3+(2+4)+4+4

8.

a. Consider the following snapshot of a system: -

Allocation	R1	R2
P1	1	3
P2	4	1
P3	1	2
P4	2	0

Request	R1	R2
P1	1	2
P2	4	3
P3	1	7
P4	5	1

R1	R2
1	4

Availability Vector

What are the maximum "needs" of each process? Is the system in a safe state? Show the working of the algorithm to arrive at the answer. (P1, ..,P4 and R1, R2 denote processes and resource types respectively)

b. What problems arise in the following memory management techniques: (i) dynamic partitioning, (ii) paging, (iii) segmentation

(4+8)+8

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