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SCHOOL OF COMPUTER SCIENCE AND ENGINEERING (SCOPE)

Continuous Assessment Test – II (Open Book), October 2017

B.Tech (Common to all), Fall Semester, 2017

Course Code : CSE2005 Duration : 90 Minutes

Course Name : Operating Systems Max. Marks : 50

(Answer all the questions)

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Part – A Multiple Choice Questions (5 x 1= 5 Marks)

1. Consider a positive counting semaphore S. Assume that the wait operation P(S) decrements S, and signal operation V(S) increments S. While execution, 10 P(S) operations and 6 V(S) operations are issued in sequence. The largest initial value of S for which at least one P(S) wait operation will remain blocked is _____

(a) 1 (b) 2 (c) 3 (d) 4

2. Where does the swap space reside?

(a) ROM (b) RAM (c) Disk (d) On-chip cache

3. A system has 5 identical resources and M processes competing for them. Each process can request atmost 2 resources. Which one of the following values of N could lead to a deadlock?

(a) 5 (b) 4 (c) 3 (d) 2

4. In a resident-OS computer, which of the following system software must reside in the main memory under all situations?

(a) Loader (b) Linker (c) Assembler (d) Compiler

5. A 1500 Kbyte memory is managed using variable partitions but no storage compaction. It currently has two partitions of sizes 250 Kbytes and 360 Kbytes respectively. The smallest allocation request in Kbytes that could be denied is for

(a) 151 (b) 181 (c) 231 (d) 541

Part – B Fill in the blanks (5 x 1= 5 Marks)

6. The following program consists of 3 concurrent processes and 3 binary semaphores. The semaphores are initialized as S0 = 1, S1 = 0, S2 = 0. Then the process P0 prints '0' _____ many number of times.

3

W(S0) = 0

Process P0	Process P1	Process P2

while (1) {
wait (S0);
print '0';
release (S1);
release (S2);
}
	wait (S1);
	release (S0);
		wait (S2);
		release (S0);

7. In concurrent programming, a _____ is a synchronization construct that allows threads to have both mutual exclusion and the ability to wait (block) for a certain condition to become true. They also have a mechanism for signaling other threads that their condition has been met.

8. The segmentation creates _____ fragmentation.

9. _____ is a high speed cache used to hold recently referenced page table entries a part of paged virtual memory.

10. _____ is the EAT (Effective access time) if 5 micro second is associative look-up time and 0.20 is the miss-ratio in paging hardware with TLB.

Part – C Match the following (5 × 1= 5 Marks)

11. MMU	-	(a) Deadlock avoidance
12. Cycle	-	(b) Best-fit
13. Unsafe state	-	(c) Internal fragmentation
14. Paging	-	(d) Deadlock detection
15. Little fragmentation	-	(e) Hardware

Part – D (3 × 5 = 15 Marks)

16. The Thirsty Person Problem (adopted from the Cigarette Smokers Problem): To drink, a thirsty person must have three things: water, ice and a glass. There are three thirsty people, each having a different one (and only one) of the three required items. A fourth person, a server, has an unlimited supply of all three items. If nobody is drinking, the server places two of the three items (chosen at random) onto a table. The thirsty person who can make a drink from those two items will pick them up and drink a glass of ice water. When done, the thirsty person will notify the server and the process will repeat. Write a monitor solution to control the thirsty people and the server in the following program. [5 Marks]

[P.T.O]

// Server

while (1){ drinkers.Serve(); }

// Drinker (type is water or ice or glass

while (1){ drinkers.GetIngredients(type); drink( ); drinkers.NotifyServer(type); }

17. On a system using simple segmentation, compute the physical address for each of the logical addresses, given the following segment table. If the address generates a segment fault, indicate so. [5 Marks]

Segment	Base	Length
0	330	124
1	876	211
2	111	99
3	498	302

(a) 0, 99

(b) 2, 78

(c) 1, 265

(d) 3, 222

(e) 0, 111

18. (a) On a simple paged system, associative registers hold the most active page entries and the full page table is stored in the main memory. If references satisfied by associative registers take 100 ns, and references through the main memory page table take 180 ns, what must the hit-ratio be to achieve an effective access time of 125 ns? [2 Marks]

(b) Why is paging faster than segmentation? [2 Marks]

(c) Valid-invalid bit for a page in a page table [1 Marks]

(i) Helps avoid unnecessary writes on paging device

(ii) Helps maintain LRU information

(iii) Allows only read on a page

(iv) None of the above

Part - E (2 X 10 = 20 Marks)

(Answer all the questions)

19. Consider a system with 4 types of resources R1 (3 units), R2 (2 units), R3 (3 units), R4 (2 units). A non-preemptive resource allocation policy is used. At, any given instance, a request is not entertained if it cannot be completely satisfied. Three processes P1, P2, P3 request the resources as follows if executed independently.

Process P1:	Process P2:	Process P3:
t=0: requests 2 units of R2	t=0: requests 2 units of R3	t=0: requests 1 unit of R4
t=1: requests 1 unit of R3	t=2: requests 1 unit of R4	t=2: requests 2 units of R1
t=3: requests 2 units of R1	t=4: requests 1 unit of R1	t=5: releases 2 units of R1
t=5: releases 1 unit of R2 and 1 unit of R1	t=6: releases 1 unit of R3	t=7: requests 1 unit of R2
t=7: releases 1 unit of R3	t=8: Finishes	t=8: requests 1 unit of R3
t=8: requests 2 units of R4		t=9: Finishes
t=10: Finishes		

Which one of the following statement is TRUE if all three processes run concurrrently starting at time t=0? Justify your answer with necessary steps.

(a) All processes will finish without any deadlock (b) Only P1 and P2 will be in deadlock (c) Only P1 and P3 will be in deadlock (d) All three processes will be in deadlock

20. (a) Compare paging with segmentation with respect to the amount of memory required by the address translation structures in order to convert virtual addresses to physical addresses. Justify your answer with relevant diagrams. [5 Mark]

(b) Consider the following process for generating binary executables. A compiler is used to generate the object code for individual modules (files of source code), and a linkage editor is used to combine multiple object modules into a single program binary. How does the linkage editor change the binding of instructions and data to memory addresses? What information needs to be passed from the compiler to the linkage editor to facilitate the memory-binding tasks of the linkage editor? [3 Marks]

(c) Elucidate any one of the hardware locking mechanisms with suitable code. [2 Marks]