(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 1031 Roll No. | | | | | | | | | | |

B.Tech.

FOURTH SEMESTER EXAMINATION, 2004-2005

OPERATING SYSTEM

Time : 3 Hours *Total Marks : 100*

Note : *(i) Attempt ALL questions.*

(ii) All questions carry equal marks.

(iii) In case of numerical problems assume data wherever not provided.

1. Attempt *any four* parts of the following : (5x4=20)

(a) Give four major functions of an operating system. Explain each of them in brief.

(b) Explain system calls and system programs in brief.

(c) What is spooling ? Explain.

(d) What is real time system ? Explain alongwith its kinds.

(e) The payroll program reads the monthly attendance details of 2000 employees and prints their payroll. Reading a card and printing of a line consumes 200 m. sec each, while a read or write operation on magnetic page consumes 12 m. sec. Salary processing consumes 6 m. sec of CPU time. What are the program elapsed time and CPU idle time with and without spooling.

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(f) The following expressions describe the serial/parallel precedence relationship among six processes P1 through P6 :

P (S (P (P3, S (P1, P (P6, P5))), P2), P4)

Where P indicates parallel and S indicates serial. Transform the expression into program using Fork-Join Constructs.

2. Attempt *any two* parts of the following : **(10x2=20)**

(a) Draw and explain the "Process Transition Diagram".

(b) Consider a variation of round robin, we will call progressive round robin. In progressive round robin each process has its own quantum. This starts out at 50 ms, and increases by 50 ms each time it goes through the round robin queue. So long jobs keep getting longer and longer time slices. Give the advantages of this variant over ordinary round robin. You are also required to give disadvantages of this variant over ordinary round robin.

(c) Assume you have the following jobs to execute with one processor :

Jobs	Burst Time	Arrival Time
1	9	0
2	5	2
3	6	3
4	4	5
5	8	6

(i) Give a Gautt Chart illustrating the execution of these jobs using Shortest Remaining Time First (SRTF) algorithm.

(ii) Calculate average turn around and waiting time.

3. Attempt *any two* parts of the following : **(10x2=20)**

(a) Explain multiport organization of multiprocessor system with suitable diagram.

(b) Use tree height reduction technique to produce versions of the following expressions more amenable to parallel evaluation. In each case draw evaluation trees for the original expression and new expression :

(i) $(p + (q + (r + s)))$

(ii) $(m + (n*p*q*r) + a + b + c)$

(iii) $(a*(b + c + d*(e + f)))$

(c) Transform the precedence graph of Fig.1 to a program using.

(i) Fork and Join Constructs

(ii) Concurrent statements

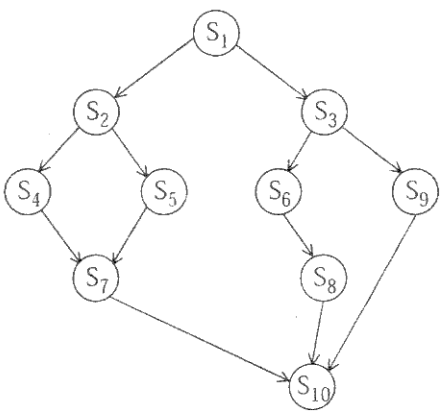

figure - 1

4. Attempt *any two* parts of the following : (10x2=20)

(a) (i) In a paged-segmented system, a virtual address consists of 32 bits of which 12 bits are displacement, 11 bits are a segment number and 9 bits are page number. Calculate :

(a) Page size

(b) Max. segment size

(c) Max. number of pages

(d) Max. number of segments

(ii) Given a 4 Giga bytes (approximately 4.3×10^9bytes) of virtual space and typical page size of 4 K bytes. How many virtual pages would this imply ? If each page table entry is 5 bytes, how much space is required for the whole page table ?

(b) Discuss the issue of how programming style affects performance in paging system. Consider each of the following :

(i) Top-down approach

(ii) Minimal use of GOTOs

(iii) Modularity

(iv) Recursion

(v) Iteration

(c) (i) Consider a paging system with the page table stored in memory :

(a) If a memory reference takes 1.2 micro-seconds, how long does a paged memory reference take ?

(b) If we add 8 associative registers and 75% of all page table references are found in the associative registers, what is the effective memory reference time ? (Assume that finding a page table entry in the associative registers takes zero time, if it is there)

(ii) Consider the following page reference string :

1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6

How many page faults would occur for the Least Recently Used (LRU) algorithm using three 3 frames only. Remember all frames are initially empty.

5. Attempt *any two* parts of the following : **(10x2=20)**

(a) Suppose you had immediate access (through memory cell) to the current cylinder and sector of a disk. Suppose the disk has 400 cylinders and it takes one millisecond to seek over a cylinder. Suppose disk has 32 sectors per track and it takes 0.5 ms to spin over one sector. Write an unified shortest access time first scheduling algorithm for this disk. The algorithm should choose the closest request, taking both cylinder and sector into account. Assume you have a queue of requests, each with a cylinder and sector number.

(b) It is proposed to use a multi-resource Banker's algorithm in an OS containing 3 resource classes. The number of resource units available for allocation is 7, 7 and 10 respectively. The current resource allocation state is shown as given below :

Process	Allocated Resources			Maximum Requirements			Available Resources		
	R1	R2	R3	R1	R2	R3	R1	R2	R3
P1	2	2	3	3	6	8	7	7	10
P2	2	0	3	4	3	3			
P3	1	2	4	3	4	4			

(i) Is the current allocation state safe ?

(ii) Would the following requests be granted in the current state ?

- Process P1 requests (1, 1, 0)
- Process P2 requests (0, 1, 0)
- Process P3 requests (0, 1, 0)

(c) (i) Explain the protocol to be used to break the circular-wait condition of deadlock. You are also required to prove the validity of the protocol.

(ii) Latency optimization usually has little effect on system performance except under heavy loads. Why ?

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