Roll No. _____

Pandit Deendayal Petroleum University, Gandhinagar
School of Technology
End Semester Examination

B. Tech. (Computer Engineering/ICT) | **Semester – V**
Date: 13/12/2018 | **Time: 10.00 am to 1.00 pm**
Course Name : Operating Systems | **Course Code : 18CP301T**
Max. Marks: 100

Instructions:
1. Do not write anything other than your roll number on question paper.
2. Assume suitable data wherever necessary and mention your assumptions clearly.
3. Write appropriate units, nomenclature and draw neat sketches/schematics, wherever required.
4. Answer all parts of a question continuously.

Q.1 **Answer the Following (Attempt any four)** **[20]**

1. Define the following terms [5]
   Thrashing, Locality of Reference, Page fault, Priority Inversion, Compaction
2. Write Short note on System call, explain process control system calls in detail [5]
3. What is the problem with Peterson approach? Explain producer consumer problem, also consider preemption before sleep(). [5]
4. List and explain requirements of synchronization mechanisms considering LOCK variable and Test Set Lock. [5]
5. List and explain algorithms applied on linked list in order to find out holes and allocate it to processes. [5]

Q.2 **Answer the following (Attempt any four)** **[20]**

1. Explain process state transition diagram [5]
2. Write in detail about Page Table Entry [5]
3. Write short note on Virtual Memory [5]
4. Explain FIFO and LRU page replacement algorithms [5]
5. Explain multi-level paging concept. [5]

Q.3 **Answer the following** **[20]**

1. Fill up the blank entries in such a way that Page Table will fit in one page in single level paging. [5]

Virtual Address Space	Page Size	Page Table Entry
4 GB	128 KB	
128 TB	32 MB	
256 MB		4 B
512 KB		2 B
16 GB		4 B

2. A paging scheme uses TLB, TLB access, memory access, TLB hit, Page Table levels and Effective Memory access time for few entries are given below, fill up the remaining blanks. [5]

TLB Access time	Memory Access	TLB Hit	Page Table Levels	EMAT
20 ns	100 ns	80 %	1	
20 ns	100 ns		2	160 ns
	100 ns	80 %	3	180 ns
20 ns	100 ns		1	130 ns
20 ns		50 %	1	170 ns

3. Explain belady's anomaly considering LRU and FIFO for the reference string as 0,1,2,3,0,1,4,0,1,2,3,4 Also justify will the belady's anomaly occur every time with FIFO. [5]

4. Explain working set algorithm. Let the window size be 4. Calculate the average frame requirement for the following reference string [5]
   a. 1, 2, 3, 1, 2, 4, 1, 4, 2, 1, 5, 1, 2, 4, 2, 1
   b. a, d, e, c, c, d, b, c, e, c, e, a, d

Q.4 Answer the following **[20]**

1. Given below is the resources allocated, maximum requirement and future need and available resources as (3, 2, 2), Considering the following requirement identify safe and unsafe states for allocation of resources. [4]

Requirement 1: P0(0,0,2)
Requirement 2: P1(2,0,0)

	Allocated			Maximum			Needed		
	X	Y	Z	X	Y	Z	X	Y	Z
P0	0	0	1	8	4	3	8	4	2
P1	3	2	0	6	2	0	3	0	0
P2	2	1	1	3	3	3	1	2	2

2. Consider the following table with process no, priority, Arrival time and Burst time. Fill up the remaining entries considering non-preemptive and preemptive priority scheduling algorithm. [8]

P. No.	Priority	Arrival Time	Burst Time	Completion Time	Turn Around Time	Waiting Time	Response Time
1	1 (L)	0	4				
2	3	1	2				
3	6	2	3				
4	10	3	5				
5	8	4	1				
6	14 (H)	5	4				
7	9	6	6				

3. For the disk scheduling algorithms, let the head starts at 53, considering the reference queue as 98, 183, 37,122, 14, 124, 65, 70. Calculate the total head movement for the FCFS, SSTF, SCAN, C-LOOK algorithms. [8]

Q.5 A Answer the following **[10]**

1. [2]

Process P	Process Q

while(1)
{
W: printf('0');
printf('0');
X:
}
	while(1)
	{
	Y: printf('1');
	printf('1');
	Z:
	}

S and T are mutexes, Synchronization statements can be inserted at only W, X, Y & Z labels. Which of the following will lead to an output starting with 001100110011…

a) P(S) at W, V(S) at X, P(T) at Y, V(T) at Z, S&T initially '1'
b) P(S) at W, V(T) at X, P(T) at Y, V(S) at Z, S=1 & T =0 initially
c) P(S) at W, V(T) at X, P(T) at Y, V(S) at Z, S&T initially '1'
d) P(S) at W, V(S) at X, P(T) at Y, V(T) at Z, S=1 & T=0 initially

2. Using the code given in Q.5 1., Which of the following will ensure that output will never contain a substring of form 01^n0 or 10^n1, where n is odd. [2]
   a) P(S) at W, V(S) at X, P(T) at Y, V(T) at Z, S&T initially 1
   b) P(S) at W, V(T) at X, P(T) at Y, V(S) at Z, S&T initially 1
   c) P(S) at W, V(S) at X, P(S) at Y, V(S) at Z, S initially 1
   d) V(S) at W, V(T) at X, P(S) at Y, P(T) at Z, S&T initially 1

3. Consider 4 jobs P1, P2, P3 and P4 arriving in ready queue in the same order at time=0. IF BT requirements of these jobs are 4,1,8,1 respectively, what is CT of P3, assuming RR with TQ=1. [2]

4. A computer system has 6 tape drives, with n processes competing for them. Each process needs 4 tape drives. Find the maximum value of n for which system is guaranteed to be deadlock free. [2]

5. Which of the following is not an advantage of using shared, dynamically linked libraries as opposed to using statically linked libraries?
   a) Smaller sizes of executable files.
   b) Lesser overall page fault rate in the system.
   c) Faster program startup
   d) Existing programs need not be re-linked to take advantage of newer versions of libraries.

Q.5 B Answer the following: **[10]**

1. Explain paging, segmentation, and paged segmentation with necessary example. [7]
2. Explain file access methods? [3]

OR

Q.5 B Answer the Following **[10]**

1. Explain the basic working principle of page replacement algorithm and how it is useful in LRU and Optimal. Explain with suitable example. [5]
2. Sometimes leaving Internal fragmentation is beneficial then handling. Justify your answer with suitable example. [5]