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UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2017

Program: Btech CSE+All IBM Programs **Semester – III**
Subject (Course): Operating Systems **Max. Marks : 100**
Course Code : CSEG-228 **Duration : 3 Hrs**
No. of page/s:

Instruction: All Questions are Compulsory

Section A

(4 *5 =20)

1 What is the role of critical section in process synchronization?

2 Differentiate between multilevel feedback queue and multilevel queue algorithm.

3 Discuss the booting process sequence in order to explain how operating system takes control on computer system.

4 How Access control matrix controls the access rights of different resources, explain with suitable example.

5 Discuss the producer consumer problem with proper example.

Section B

(8*5=40)

6 In a paging system with TLB, it takes 40 ns to search the TLB and 120 ns to access memory. If the TLB hit ratio is 80%, find the effective memory access time. What should be the hit ratio to achieve an effective access time of 220 ns?

7 Discuss necessary and sufficient conditions for deadlock to occur with suitable diagram.

8 Discuss process life cycle and process control block. What is the significance of context Switching? Discuss semaphore.

9 A disk having 200 Cylinders (0-199) and disk queue with requests for the I/O to block on cylinders is given as: 95, 180, 34, 119, 11, 123, 62, 64. The Read-Write head is initially at the track 50. Calculate the total seek time (number of tracks movement) using SSTF and FCFS algorithms.

10 Assume highest number is highest priority, find the average waiting time and average turnaround time showing the Gantt Chart for each schedule using preemptive priority scheduling algorithm.

Process	Arrival Time	Execute Time	Priority	Service Time
P0	0	5	1	9
P1	1	3	2	6
P2	2	8	1	14
P3	3	6	3	0

Section C

(20*2=40)

11.

a) Consider the following snapshot of a system (10 marks)

	Allocation	Max	Available
	A B C D	*A B C D*	*A B C D*
*P*0	0 0 1 2	0 0 1 2	1 5 2 0
*P*1	1 0 0 0	1 7 5 0	
*P*2	1 3 5 4	2 3 5 6	
*P*3	0 6 3 2	0 6 5 2	
*P*4	0 0 1 4	0 6 5 6	

Answer the following questions using the banker's algorithm:
a. What is the content of the matrix Need?
b. Is the system in a safe state? If yes, What is the safe sequence?
c. If a request from process *P*1 arrives for (0, 4, 2, 0), can the request be granted immediately

b). Explain Belady's anomaly. Follow the given page request sequence and applies FIFO page replacement policy with 3 frames and calculate the page fault. [10 Marks]

3 2 1 0 3 2 4 3 2 1 0 4

Show belady's anomaly in above (if exist), if total frames are 4.

12.

a) Discuss Bounded Buffer Producer Consumer classical synchronization problem solution.

[10 Marks]

b) Consider a single level paging memory system with a RAM size of 4 GB (where main memory in Byte Addressable). The Logical Address space is divided into 256M pages (number of pages) with each page having size of 512 Bytes. Calculate the following with reference to the following [10 Marks]

a). Length of logical address (in bits)

b). Length of physical address (in bits)

c). find the logical address division as p and d (in bits)

d). No. of frames in the physical address

e). find the physical address division as f and d (in bits)

f). No. of entries in the page table

g). Size of entry of the page table.

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Section A

(4 *5 =20)

1 a). Define Multiprogramming O.S. Differentiate it with Multiprocessing O.S. **[2 Marks]**
b). What is kernel in Operating System? Describe microkernel**.** **[2 Marks]**

2 a). Why threads are called lightweight process? **[2 Marks]**
b). Differentiate between user level thread and kernel level thread. **[2 Marks]**

3 a). Describe the role of short term, long term and medium-term scheduler. Which scheduler controls the degree of multiprogramming and which scheduler is known as the CPU scheduler. **[2 Marks]**
b). What are the information related to a process stored in the process control block (PCB)? How PCB maintains the information of page table. **[2 Marks]**

4. A disk having 200 Cylinders (0-199) and disk queue with requests for the I/O to block on cylinders is given as:

98 183 37 122 14 124 65 67

Process these requests using C-SCAN .

5.SRTF or Shortest Remaining Time First is the preemptive SJF. The process with arrival time and burst time given below. Calculate the response time and waiting time for each process if SRTF is used to schedule these processes.

Process	**Arrival Time**	**Burst Time**
P1	0	5

P2	1	3
P3	2	3
P4	4	1

Section B

(8*5=40)

6 . Consider the methods used by processes P1 and P2 for accessing their critical sections whenever needed, as given below. The initial values of shared Boolean variables S1 and S2 are randomly assigned. Find out which of the following is satisfied (provide proper explanation of your answer)

a). Progress b). Mutual Exclusion c). Bounded Wait

Process 1	**Process 2**
while (S1 == S2) ; **Critica1 Section** **S1 = S2;**	while (S1 != S2) ; Critica1 Section S2 = not (S1);

7 Discuss the single and multiple instance resource. Write a short note on deadlock.

8 Draw well labelled diagram of process life cycle and task control block. What is the significance of context switching?

9 Consider queue -- 95, 180, 34, 119, 11, 123, 62, 64 with the Read-write head initially at the track 34 and the tail track being at 123 discuss the algorithms Look and FCFS along with advantages and disadvantages.

10. Consider 100 Hz CPU, three processes, which require 10, 20 and 30 secs and arrive at times 0, 2 and 6 secs respectively. How many context switches are needed if the operating system implements a shortest remaining time first (SRTF) scheduling algorithm? Do not count the context switches at time zero and at the end. Consider cycles elapsed for one context switch is 10 cycles. Compute percentage of time spent in context switching.

Section C

(20*2=40)

11.

Consider the table given below for a system, find the need matrix and the safety sequence,Is the request from process P1(0, 1, 2) can be granted immediately.

Resource – 3 types;A – (10 instances);B – (5 instances);C – (7 instances)

[10

Marks]

Process	Allocation			Maximum		
	A	B	C	A	B	C
P0	0	1	0	7	5	3
P1	2	0	0	3	2	2
P2	3	0	2	9	0	2
P3	2	1	1	2	2	2
P4	0	0	2	4	3	3

b). Explain Monitor. Follow the given page request sequence and apply LRU page replacement policy with 3 frames and 4 frames and calculate the page fault. [10 Marks]

0 2 1 6 4 0 1 0 3 1 2 2

Discuss increase in and performance improvement of an algorithm

12.

a) What is inverted page table? Explain with diagram. How it reduces the requirement of space for the storage of page table. Write its advantage and disadvantages of inverted page table. [10 Marks]

b) What is swapping? Why is it used in systems with variable-length partitions? Why is it used in systems with paging?

Consider logical address 1025 and the following page table for some process P0. Assume a 15-bit address space with a page size of 1K. What is the physical address to which logical address 1025 maps?

8
0
2