

**MCA DEGREE EXAMINATIONS: DEC 2014**

(Regulation 2013)

Second Semester

**MASTER OF COMPUTER APPLICATIONS**

P13CAT204: Operating Systems

**Time: Three Hours**

**Maximum Marks: 100**

**Answer all the Questions:-**

**PART A (10 x 2 = 20 Marks)**

1. OS can relinquish the control of a process from CPU and memory, to provide it for another process. But the same cannot be applied for I/O devices, why?
2. What is real-time system? Under what type the weather *forecasting and traffic control* applications are classified?
3. Comment on the following “Threads need a separate stack”.
4. What is convoy effect? Which process scheduling algorithm suffers from this effect?
5. Rewrite the following arithmetic expression to take the advantage of concurrent programming. Use parbegin and parend to delimit the concurrent sections.  
 $(X*(Y*Z*W*R)+M+N+P)$
6. Draw a resource allocation graph for the following: p1 is requesting r1 and r2, p2 is allocated with r1, r2 and requesting r3, p3 is allocated with r3 and r4. There are 2 instances of r1, 1 instance of r2, r3 and r4. Derive a wait for graph from this RAG.
7. If the process consisting of 3 pages A,B and C and the page table is given as

Page #	Frame #	Present bit
0(A)	2	1
1(B)	3	1
2(C)	0	0

What you understood from this PT? Which type of memory management supports this?

8. Compare external fragmentation with internal fragmentation.
9. What type of file organization is used when it is needed to maximize the speed of access, optimizing the space usage etc. when data are:
  - (i) Updated infrequently and access frequently in random order.
  - (ii) Updated frequently and access relatively frequently.

10. The secondary storage free space is managed by means of bitmap. The initial bitmap is 1000 0000 0000 0000 where there are 20 blocks out of which first block is used as boot block. What is the bitmap structure for the following allocations and deallocations?
- (i) allocate file a – requires 6 blocks
  - (ii) allocate file b – requires 5 blocks
  - (iii) deallocate file a
  - (iv) allocate file c – requires 5 blocks

**Answer any FIVE Questions:-**

**PART B (5 x 16 = 80 Marks)**

**Q.No:11 is Compulsory**

11. What type of interprocess communication can be used for the following scenario? A fast food restaurant has four kind of employees: 1) Order takers, who take customer orders; 2) cooks, who prepare the food; 3) packaging specialists, who stuff the food into bags; 4) cashiers, who give the bags to the customers and take their money. Each employee can be considered as a communicating sequential process. Explain the interprocess communication method in detail that has to be used for this scenario.
12. (i) Define the essential properties of the following types of operating systems: (8)
- (a) Batch
  - (b) Time sharing
  - (c) Real time
  - (d) Distributed
- (ii) In what way is the modular kernel approach similar to the layered approach? In what ways does it differ from the layered approach? (8)
13. (i) What is dispatch latency? Calculate the average waiting time and the average (8) turnaround time using FIFO, SPN, SRTN, Priority for the following set of process.

Process ID	Arrival time	Burst Time	Priority
1	0	10	1
2	4	2	4
3	6	10	3
4	8	5	5
5	10	1	6
6	11	8	2

Note: Highest number having highest priority

- (ii) What are the two differences between user-level threads and kernel-level threads? (8)  
Under what circumstances is one type better than the other?

14. (i) Explain the Banker's algorithm for checking the state of current resources allocation? (8)  
(ii) An OS contains 3 resource classes. The number of resource units in these classes is 7,7 and 10 respectively. The current resource allocation state is as shown below:

	Allocated resources			Maximum requirements		
	R1	R2	R3	R1	R2	R3
Process P1	2	2	3	3	6	8
Process P2	2	0	3	4	3	3
Process P3	1	2	4	3	4	4

- a. Is the current state is safe? Justify the answer.  
b. Would the following requests be granted in the current state?  
i. Process p1 requests (1,1,0)  
ii. Process p3 requests (0,1,0)  
iii. Process p2 requests (0,1,0)

15. (i) Consider the demand paging system with following time measures: (8)

CPU Utilization      20%  
Swap Disk            97%  
Other I/O devices    5%

Which of the following will improve the performance of the system?

- (a) Install a faster CPU  
(b) Install more main memory  
(c) Increase page size  
(d) Add pre-paging to the fetch algorithm  
(e) Decrease the multiprogramming level

- (ii) What are the causes of thrashing? How does the system detect thrashing? Once it detects thrashing, what can the system do to eliminate this problem? (8)

16. (i) Discuss the various file access methods and directory structure of file system. (8)

- (ii) Consider a file currently consisting of 100 blocks. Assume that the file control block is already in memory. Calculate how many disk I/O operations are required for contiguous, linked, and indexed allocation strategies, if for one block, the following

conditions hold. In the contiguous-allocation case, assume that there is no room to grow at the beginning but there is room to grow at the end. Also assume that the block information to be added is stored in memory.

- (a) The block is added at the beginning
- (b) The block is added in the middle
- (c) The block is added at the end

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