

Y 1541

M.C.A. DEGREE EXAMINATION, AUGUST/SEPTEMBER 2008.

Second Semester

DMC 1655 --- OPERATING SYSTEMS

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A --- (10 × 2 = 20 marks)

1. In a multiprogramming environment, a scheduler must make decisions about which job will be given the CPU (CPU scheduler) or loaded into memory from the job pool (job scheduler). What factors are required to maximise system efficiency in both the cases?
2. What is the purpose of a system call?
3. Describe a process. In what ways does a process differ from a program?
4. Discuss how the choice of implementing a preemptive or non-preemptive scheduling algorithm affects the user of a computer system.
5. What are the conditions required for deadlock to occur? Is it possible for these to be eliminated? Explain.
6. State the algorithm for Monitor implementation using Semaphore.
7. Differentiate Contiguous and Non Contiguous Storage allocation.
8. Memory allocation (to a process) using fixed sized partitions is generally inefficient and sometimes inappropriate. Explain.
9. List and Explain briefly the usage of different data structures for a directory.
10. What are the main advantages of implementing threads in the kernel rather than in a user-mode library?

PART B — (5 × 16 = 80 marks)

11. (a) (i) What characteristics should be considered when describing the nature of an operating system? Using the characteristics listed above, describe the nature of the different types of operating systems, clearly show the differences between them. (12)
- (ii) Distinguish the features of an operating system in a main frame system with that of a desktop system. (4)

Or

- (b) (i) Compare and contrast the various factors related to Distributed, Clustered and Real time systems. (6)
- (ii) With a neat sketch explain the structure of an Operating system. Elaborate on the services of an Operating System. (10)
12. (a) (i) What problems exist if both real time and time sharing processes run simultaneously on the same computer system? How might these problems be overcome? (6)
- (ii) Draw a Gantt diagram (or timing diagram) that illustrates which process is allocated the CPU at each time unit using Non – Preemptive SJF and Preemptive SJF for the processes listed in Table 1.

Process	Arrival Time	Burst Time
P1	0.0	7
P2	0.2	4
P3	4.0	1
P4	5.0	4

Also assume if P2 arrives at time four what statistics change? What are the new values? Evaluate the different performances in two cases – Average Wait time, Average turnaround time and throughput. (10)

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- (b) (i) Explain Interprocess communication using Producer - Consumer Problem. (8)
- (ii) Explain in detail the five state Process model with a neat state transition diagram. (8)
13. (a) The two major approaches to dealing with deadlocks are deadlock detection and deadlock avoidance.
- (i) What factors must be considered in deciding whether to employ deadlock avoidance as opposed to deadlock detection? (8)
- (ii) Outline an algorithm for deadlock avoidance and provide an argument that shows that it is not possible for a system to deadlock if such an algorithm is used. (8)

Or

- (b) Consider the snapshot of a system :

	Allocation	Max	Available
	A B C D	A B C D	A B C D
P0	0 0 1 2	0 0 1 2	1 5 2 0
P1	1 0 0 0	1 7 5 0	
P2	1 3 5 4	2 3 5 6	
P3	0 6 3 2	0 6 5 2	
P4	0 0 1 4	0 6 5 6	

Answer the following questions using Banker's algorithms : (4 × 4 = 16)

- (i) What is the content of the matrix Need?
- (ii) Is the system in a safe state? (If yes, then determine a safe sequence).
- (iii) If a request from process P1 arrives for (0, 4, 2, 0), can the request be granted immediately? Justify your answer. If yes, show the new system state after allocation is made and determine a safe sequence.
- (iv) State and explain the Banker's Algorithms.

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14. (a) 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 following replacement algorithms, assuming one, three, five or seven frames? Remember all frames are initially empty, so your first unique pages will all cost one fault each.

Use LRU replacement, FIFO replacement and Optimal replacement algorithm and compare the results. (16)

Or

(b) Write short notes on : (2 × 8 = 16)

(i) Demand Paging

(ii) Internal and External fragmentation.

15. (a) (i) Discuss the three major methods of file system implementations by which disk space can be allocated. In each case mention what needs to be stored in a directory entry for file. (do not discuss free space management). (9)

(ii) The Linux kernel does not allow paging out of kernel memory. What effect does this restriction have on the kernel's design? Name two advantages and two disadvantages of this design decision (7)

Or

(b) (i) Explain the algorithm and distinguish between the sequential access method and direct access method. (6)

(ii) Describe the different directory – single level, two level, tree structured and acyclic – graph directories with neat sketches. (10)