

Total No. of printed pages = 4

**MCA 202105**

Roll No. of candidate

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25/3/22

2022

DEVA CHIN...

APR 11 2022  
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**M.C.A 1<sup>st</sup> Semester End-Term Examination**

**OPERATING SYSTEMS**

**New Regulation (w.e.f 2020 – 21) &**

**New Syllabus (w.e.f 2020 – 21)**

Full Marks – 70

Time – Three hours

The figures in the margin indicate full marks for the questions.

Answer Question No.1 and any *four* from the rest.

1. Pick the most correct answer from each of the questions below: (10 × 1 = 10)
- (i) When a process creates a new process using the fork () operation, which of the following states is shared between the parent process and the child process?
- (a) Stack  
(b) Heap  
(c) Shared memory segments  
(d) None of the above
- (ii) Increasing the RAM of a computer typically improves performance because
- (a) Virtual Memory Increases      (b) Larger RAMs are faster  
(c) Fewer page-faults occur      (d) More segmentation faults occur
- (iii) A Thread is a
- (a) Light weight process      (b) Heavy weight process  
(c) Multi-process      (d) I/O process
- (iv) A command Interpreter is also known as a
- (a) Prompt      (b) Kernel  
(c) Command      (d) Shell

[Turn over



- (v) The most optimal CPU scheduling algorithm is
- (a) Shortest-Job first                      (b) Round Robin  
(c) Priority                                      (d) None
- (vi) Semaphore is a \_\_\_\_\_ and it helps to solve the problem of \_\_\_\_\_.

- (a) atomic, critical section  
(b) integer variable, memory error  
(c) integer variable, critical section  
(d) atomic, memory error

- (vii) The 2 types of semaphores are

- (a) Counting and Binary semaphore  
(b) Counting and Mutex  
(c) Counting and Decimal semaphore  
(d) None of the above

- (viii) Which of the following is also known as the Base register?

- (a) Relocation                                      (b) Regular  
(c) Delocation                                      (d) Memory register

- (ix) When can binding of instructions and data to memory addresses be done?

- (a) Compile time                                      (b) Load time  
(c) Execution time                                      (d) All of the above

- (x) Which of the following is a visual way of identifying the occurrence of deadlocks.

- (a) Starvation graph                                      (b) Resource allocation graph  
(c) Ballady's anomaly                                      (d) none of the above

2. (a) What are the two different approaches for providing an user interface? (1)
- (b) What is a system call? List at least three of the major categories of system calls. How is an API different from it? (1 + 3 + 2 = 6)
- (c) How is a mobile OS different from a typical standard OS? What do mobile operating systems often include in addition to the core kernel? (1 + 2 = 3)
- (d) What is an interrupt? What special operation triggers a software interrupt? What is an interrupt Vector? Where are return addresses for interrupts stored? (2 + 1 + 1 + 1 = 5)



3. (a) What is a process? What are the contents of PCB? How is a thread different from a process? (1 + 2 + 2 = 5) (2)
- (b) What is a scheduler? (2)
- (c) What are Job queues, Ready queues and device queues? What is graceful degradation? (3 + 1 = 4)
- (d) What is a context switch? What is a dispatcher? What is dispatch latency? (2 + 1 + 1 = 4)
4. (a) Define Race condition. What is Critical Section Problem? What are the requirements that a solution to C-S problem must satisfy? (2 + 2 + 2 = 6) (2)
- (b) Define entry section and exit section? (2)
- (c) Show that, if the wait() and signal() semaphore operations are not executed atomically, then mutual exclusion may be violated. (3)
- (d) What is the meaning of the term *busy waiting*? What other kinds of waiting are there in an operating system? Can busy waiting be avoided altogether? Explain. (4)
5. (a) Name two differences between logical and physical addresses. Calculate the size of memory if its address consists of 22 bits and the memory is 2-byte addressable. (4)
- (b) Why are page sizes always powers of 2? Under what circumstances do page faults occur? Describe the actions taken by the operating system when a page fault occurs. (5)
- (c) Consider a logical address space of 64 pages of 1,024 words each, mapped onto a physical memory of 32 frame. (2)
- (i) How many bits are there in the logical address?
- (ii) How many bits are there in the physical address?
- (d) Consider a single level paging scheme with TLB. Assume no page fault occurs. It takes 20 ns to search the TLB and 100 ns to access the physical memory. If TLB hit ratio is 80% the effective memory access time is \_\_\_\_\_ msec. (4)
6. (a) Of the following five forms of storage rank them from fastest to slowest in terms of access time; (3)
- (i) Main memory
- (ii) Magnetic disk
- (iii) Registers
- (iv) Solid state disk
- (v) Cache

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- (b) What is the difference between protection and security? (2)
- (c) Discuss the various forms of protection mechanism of a computer system. (4)
- (d) Consider the following reference string for four page frames : (3 × 2 = 6)
- 1, 2, 3, 4, 5, 3, 4, 1, 6, 7, 8, 7, 8, 9, 7, 8, 9, 5, 4, 5, 4, 2

How many page faults would occur for the following page replacement algorithms

- (i) FIFO replacement
- (ii) LRU replacement
- (iii) Optimal replacement.

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7. (a) What are the basic operations on a file? How can a file system be mounted? Explain with an example. (5)
- (b) Explain possible methods of deadlock avoidance and discuss their merits and demerits. (5)
- (c) What is a distributed operating system? What are its advantages and limitations. (3)
- (d) What is Balady's Anomaly? (2)
8. (a) Explain preemptive and non-preemptive scheduling algorithm. (5)
- (b) Discuss demand paging. (3)
- (c) Discuss the main features of either one of the following operating systems
- (i) LINUX (5)
- (ii) Windows 10
- (d) Differentiate between waiting time and Turnaround time. (2)