BRAINWARE UNIVERSITY

Term End Examination 2024-2025
Programme – MCA-2024
Course Name – Operating System
Course Code - MCA20109
(Semester II)

Full Marks : 60   **Time : 2:30 Hours**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question)   1 x 15=15

1.   *Choose the correct alternative from the following :*

(i)   Which of the following views describes an operating system as a resource allocator?

a) System view   b) User view
c) Process view   d) Security view

(ii)   In a paging system, physical memory is divided into fixed-size blocks (frames), which helps to eliminate external fragmentation. Identify the primary benefit of paging.

a) It allocates memory in logical, variable-sized   b) It avoids external fragmentation by using
   segments.   fixed-size pages.
c) It loads the entire process into memory at   d) It guarantees zero internal fragmentation.
   once.

(iii)   Identify the main function of a device driver.

a) Manage CPU scheduling   b) Provide an interface between hardware and
                                                   the OS
c) Manage user programs   d) Allocate memory

(iv)   Which OS structure divides the system into multiple layers, each with a specific function?

a) Microkernel   b) Layered Approach
c) Hybrid System   d) Monolithic Kernel

(v)   Indicate the primary purpose of the Process Control Block (PCB).

a) To store process execution history   b) To manage process scheduling and execution
c) To track CPU utilization time   d) To store user input data

(vi)   In paging, which structure maps logical addresses to physical addresses?

a) TLB (Translation Lookaside Buffer)   b) Page Table

c) Cache Memory   d) Disk Scheduler

(vii) A linear list directory structure:

a) Searches for files sequentially

b) Uses a hash table for searching

c) Is always sorted alphabetically

d) Uses linked lists only

(viii) In the Second-Chance (Clock) algorithm, a page is given a second chance if:

a) The reference bit is set to 1

b) It has been modified recently

c) It is the most frequently used page

d) The page table is full

(ix) Analyze the effect of internal fragmentation in contiguous memory allocation. Which of the following statements is true?

a) It occurs when allocated memory is larger than required

b) It happens due to improper page table allocation

c) It can be avoided using segmentation only

d) It does not occur in paging systems

(x) Which synchronization mechanism allows multiple readers but only one writer at a time?

a) Mutex

b) Peterson's Algorithm

c) Readers-Writers Lock

d) Spinlocks

(xi) The Banker's Algorithm is used for:

a) Deadlock prevention

b) Deadlock avoidance

c) Deadlock detection

d) Recovery from deadlock

(xii) Which of the following is a deadlock prevention technique?

a) Circular Wait

b) Hold and Wait

c) No Preemption

d) Mutual Exclusion

(xiii) Which of the following best describes a Distributed Operating System?

a) Users access remote resources differently from local resources

b) Users access remote resources the same way they access local resources

c) It does not support process migration

d) It only supports data migration

(xiv) Analyze the best countermeasure against buffer overflow attacks.

a) Increasing system memory

b) Address Space Layout Randomization (ASLR)

c) Disabling encryption protocols

d) Reducing CPU frequency

(xv) Select the best example of multifactor authentication.

a) Using only a username and password

b) Using a password and a fingerprint scan

c) Using only a PIN code

d) Using an IP address for authentication

Group-B
(Short Answer Type Questions)
3 x 5=15

2. What are the scheduling criteria used to evaluate CPU scheduling algorithms? (3)
3. Explain paging, and how does it help in memory management? (3)
4. In what ways can semaphores be applied to manage process synchronization in concurrent programming? (3)
5. Discuss the function of wakelocks in Android's power management and their potential drawbacks. (3)
6. Analyze the impact of ARM and Intel architectures on mobile operating system performance and energy efficiency. (3)

OR

Analyze the role of "Power Collapse" in reducing battery consumption in mobile devices. (3)

Group-C
(Long Answer Type Questions)
5 x 6=30

7. Illustrate the process states in an operating system using a state transition diagram and explain the role of each state. (5)

8. Determine the average waiting time and turnaround time using Priority Scheduling (Non-Preemptive) for the following processes: Process P1 has a CPU burst time of 10 ms with priority 3; Process P2 has a burst time of 1 ms with priority 1; Process P3 has a burst time of 2 ms with priority 4; and Process P4 has a burst time of 1 ms with priority 2. (5)

9. Consider three processes with burst times P1 = 24 ms, P2 = 3 ms, and P3 = 3 ms, calculate the average waiting time and turn around time in case of FCFS scheduling algorithm if they arrive in the order P1, P2, P3. (5)

10. A system has a memory access time of 15 nanoseconds. The TLB hit ratio is 90%, and a TLB miss results in an additional memory access for the page table (which also takes 15 nanoseconds). Calculate the effective memory-access time (EAT). (5)

11. Discuss the Dining Philosophers Problem. (5)

12. Describe the various program and network threats that operating systems face, providing examples of each. (5)

OR

Discuss different user authentication techniques and security defense mechanisms implemented to safeguard operating systems. (5)

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