國立成功大學

113學年度碩士班招生考試試題

編　號：171

系　所：電機工程學系

科　目：計算機組織與作業系統

日　期：0201

節　次：第 1 節

備　註：不可使用計算機

※ 考生請注意：本試題不可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. (10pts, no partial point, no penalty) In the context of operating systems, which of the following statements is/are true regarding deadlock prevention and avoidance?

   (a) Deadlock prevention techniques involve designing the system in such a way that deadlocks can never occur.

   (b) Deadlock avoidance techniques dynamically analyze the resource allocation state to ensure that a safe state is maintained.

   (c) Banker's algorithm is an example of a deadlock prevention technique.

   (d) Wait-die and wound-wait are deadlock avoidance strategies used in transaction processing systems.

2. (10pts, no partial point, no penalty) Consider advanced concepts in storage management. Which of the following statements is/are true?

   (a) Copy-on-write (COW) is a technique used in file systems to duplicate data for redundancy.

   (b) Snapshotting in storage systems allows for the creation of point-in-time copies of data without consuming additional storage space.

   (c) Tiered storage involves dynamically moving data between different storage tiers based on access patterns and usage.

   (d) Write-back caching and write-through caching are two strategies used in storage systems to manage data consistency.

   (e) Redundant Array of Independent Disks (RAID) primarily focuses on optimizing storage performance without addressing data redundancy.

3. (10pts, no partial point, no penalty) In the context of process synchronization, which of the following statements is/are true?

   (a) Semaphore is a synchronization primitive that allows multiple processes to access a shared resource simultaneously.

   (b) The critical section problem involves ensuring that no two processes are in their critical sections at the same time.

   (c) Deadlocks can occur when processes are waiting indefinitely for a condition to become true.

   (d) Peterson's solution is a hardware-based approach to mutual exclusion.

   (e) Message passing is a synchronization technique that involves communication between processes using shared variables.

4. (10pts, no partial point, no penalty) Which of the following statement about virtual memory is/are TRUE?

   (a) Demand paging is a technique that brings a page into memory only when it is needed.

   (b) The working set model helps determine the minimum number of frames required to avoid page faults.

   (c) Thrashing occurs when the system spends a significant amount of time swapping pages in and out of memory.

   (d) Page tables are used to map virtual addresses to physical addresses.

   (e) The Belady's anomaly describes a situation where increasing the number of frames in a system leads to an increase in page faults.

5. (10pts, no partial point, no penalty) Which of the following statement about CPU scheduling is/are TRUE?

   (a) Round Robin scheduling assigns each process a fixed time slice, known as a quantum.

   (b) Priority scheduling allows a higher-priority process to preempt a lower-priority process.

   (c) The Shortest Job Next (SJN) scheduling algorithm minimizes the total processing time.

   (d) Aging is a technique used to prevent the "starvation" of low-priority processes in priority scheduling.

   (e) Multilevel Queue scheduling organizes processes into multiple priority levels and uses a fixed time quantum for each level.

6. (10pts, no partial point, no penalty) Which of the following statements about RISC-V and MIPS ISA is/are TRUE?

   (a) RISC-V has fixed instruction lengths, all of them are 32 bits, to simplify decoding and execution.

   (b) RISC-V support both little-endian and big-endian memory storage.

   (c) MIPS is a CISC (Complex Instruction Set Computing) architecture.

   (d) The MIPS architecture follows a load-store architecture.

   (e) x86 is an example of a RISC architecture.

7. (10pts, no partial point, no penalty) Which of the following statements about dynamic linking is/are TRUE?

   (a) In dynamic linking, if a shared library is updated, all programs using that library need to be recompiled.

   (b) The process of dynamic linking occurs entirely at runtime, not at compile-time.

   (c) Dynamic linking is more suitable for embedded systems with limited resources compared to static linking.

   (d) Dynamic linking is limited to certain operating systems and is not widely supported across different platforms.

   (e) In dynamic linking, the entire content of the shared library is loaded into memory, even if only a small portion of it is used by the program.

8. (10pts, no partial point, no penalty) Virtual memory is a technique that uses main memory as a "cache" for secondary storage. Which of the following statement about cache is/are TRUE?

   (a) Write-back cache writes data to the main memory immediately after each write operation, ensuring that the cache and main memory are always in sync.

   (b) A direct-mapped cache allows multiple cache lines to map to the same set, reducing the likelihood of cache conflicts and improving overall cache performance.

   (c) In a fully-associative cache, each memory block can be placed in any cache line, minimizing the need for replacement policies and making cache management simpler.

   (d) Least Recently Used (LRU) is a cache replacement policy that evicts the cache line containing the data that has not been accessed for the longest period.

9. (10pts) Let's multiply the binary numbers 101011 and 110110 using Booth's Algorithm. Let $Q = 101011$ be multiplicand and $M = 110110$ be multiplier.

   (a) Calculate the number of additions needed during the process.

   (b) Calculate the number of subtractions needed during the process.

10. (10pts) Consider a computer system with an associative cache. The cache has a total size of 32 KB, and each cache line can store 64 bytes of data. If the cache uses a 4-way set-associative mapping, calculate the following:

    (a) The size of each set in Byte.

    (b) The size of the tag field in bits, assuming a 32-bit memory address.