Operating Systems, Final

Fall, 2022

Time: 90 min

This is an open books/notes exam. Please write your answer in the "answer sheet".
以下是單選題每題 4 分，請選出「最正確」的答案，答案請確保選項清晰可辨，若因字跡潦草導致無法明確辨識為何選項者(例如: a 和 d)，該題不予計分。

(1) Compiler generates relocatable address representations is called (a) Compile Time Address Binding (b) Load Time Address Binding (c) Link Time Address Binding (d) Execution Time Address Binding

(2) In the "programming assignment 2 (container)," which of the following namespaces is not implemented. (a) UTS (b) NET (c) IPC (d) MNT

(3) In a system resource-allocation graph, ____. (a) a directed edge from a process to a resource is called an assignment edge (b) a directed edge from a resource to a process is called a request edge (c) a directed edge from a process to a resource is called a request edge (d) None of the above

(4) Which of the following circumstances can Non-preemptive scheduling take place? (a) when a process switches from the running state to the ready state (b) when a process switches from the waiting state to the ready state (c) when a process switches from the new state to the ready state (d) none of the above

(5) Which of the following statement is not correct? (a) PTBR can reduce context-switching time (b) TLB is the cache of page tables (c) vfork() is designed based on the COW scheme (d) in the basic paging scheme, page size is equal to frame size

(6) Which of the following can be a solution to the problem of indefinite blockage of low-priority processes? (a) Aging (b) Starvation (c) Multilevel queue (d) context switch

(7) If the base register is loaded with value 12345 and limit register is loaded with value 1000, which of the following memory address access will not result in a trap to the operating system? (a) 12345 (b) 12344 (c) 13345 (d) 13346

(8) In demand paging, (a) a page loaded in memory may never be accessed. (b) all pages that a program will access during execution are loaded in memory in the beginning. (c) a page is removed from memory when it is not cached. (d) a page is loaded in memory only when it is needed during execution.

(9) Which of the following statement is correct? (a) Base register holds the size of a page table. (b) Limitation register holds the size of a process. (c) Base and limit registers can only be loaded in kernel mode. (d) Any attempt by a user program to access memory at an address higher than the base register value results in a trap to the OS.

(10) The condition that a relatively large number of process attempting to acquire the lock is called (a) high contention (b) deadlock (c) preemption (d) starvation

(11) Which of the following is NOT true regarding conditional variable, e.g. x? (a) The wait() and signal() are operations that can be invoked on a condition variable (b) x.wait() means that the process invoking this operation is suspended until another process invokes x.wait() (c) If no process is suspended, then the signal() has no effect (d) The x.signal() operation resumes exactly one suspended process

(12) Which of the following is a correct sequence of using semaphore? (a) signal→signal (b) signal→wait (c) wait →signal (d) wait→wait

(13) Consider a computer with 64-bit logical address with single-level paging. Assuming that the page size is 8M and the memory is byte-addressed. The physical memory is 32G. Which of the following is true? (a) The maximum number of pages a process can have is 2^23 (b) The number of bits for physical memory is 20 (c) The maximum number of frames is 2^41 (d) the number of offset bits in page table is 23

(14) Which of the following is not true about Monitor? (a) a high-level construct for synchronization (b) only the process in the wait set can get the object lock (c) Only one process may be active within the monitor at a time (d) Every Java object has associated with it a single lock

(15) 14. Which of the following statement is true? (a) An unsafe state is a deadlocked state. (b) A deadlocked state is a safe state. (c) An unsafe state will lead to a deadlocked state. (d) An unsafe state may lead to a deadlocked state.

(16) Which of the following is NOT true regarding the following waiting semaphore implementation?

```
typedef struct {
        int value;
        struct process *list; // PCB list
} semaphore;
```

```
wait(semaphore *S) {
    S->value--; // 有 resource 就拿，否則多一個人等
    if (S->value < 0) {
        add this process to S->list;
        sleep();
    }
}

signal(semaphore *S) {
    S->value++; // 歸還 resource
    if (S->value <= 0) {
        remove a process P from S->list;
        wakeup(P);
    }
}
```

(a) It does not suffers from the busy waiting problem (b) Semaphore has a waiting queue associated with the semaphore (c) When a process executes the wait() operation and finds that the semaphore value is positive, it will suspend itself (d) only workable for single processor system.

(17) Given the reference string of page accesses: 1 2 3 4 2 3 4 1 2 1 1 3 1 4 and a system with three page frames, what is the final configuration of the three frames after the LRU algorithm is applied? (a) 1, 3, 4 (b) 3, 1, 4 (c) 4, 1, 2 (d) 1, 2, 3

(18) Which of the following is true about the strategy that uses page fault frequency (PFF) to prevent thrashing? (a) A new page is allocated to a process if PFF is too low. (b) A page is deallocated from a process if the PFF is too high. (c) Easier to be implemented than Working Set (d) A thrashing process tends to low high PFF.

(19) Which of the following is NOT true regarding conditional variable, e.g. x? (a) The wait() and signal() are operations that can be invoked on a condition variable (b) x.wait() means that the process invoking this operation is suspended until another process invokes x.signal() (c) The x.signal() operation resumes exactly one suspended process (d) If no process is suspended, then the signal() operation still affects the state of the semaphore

(20) One necessary condition for deadlock is _____, which states that a resource can be released only voluntarily by the process holding the resource. (a) hold and wait (b) mutual exclusion (c) circular wait (d) no preemption

(21) In a single processor system running Windows, when the kernel accesses a global

resource, it (a) uses spinlocks. (b) disables all interrupts. (c) uses a dispatcher object in the kernel. (d) uses atomic integers.

(22) In a paging system with three level page tables, suppose that the hit rate is 90% and it takes 20 ns to access TLB and 200 ns to access memory. What is the EMAT of the memory system? (a) 280ns (b) 820ns (c) 290ns (d) 220ns

(23) Consider the following snapshot of a system using the banker's algorithm, given the contents of the Available Matrix, which processes can run in the next round?

	Allocation	Max	Available
	A B C D	*A B C D*	*A B C D*
P_0	0 0 1 2	0 0 1 2	1 5 2 0
P_1	1 0 0 0	1 7 5 0	
P_2	1 3 5 4	2 3 5 6	
P_3	0 6 3 2	0 6 5 2	
P_4	0 0 1 4	0 6 5 6	

(a) P0 and P1 (b) P0 and P4 (c) P2 and P3 (d) P0 and P3

(24) A TLB is used to (a) cache page table entries. (b) store the address of the page table in memory. (c) store size of the logical address space of the currently running process. (d) store page size.

(25) Which of the following scheme is viable in a 64-bit computer system? (a) hashed page tables (b) classical page table (c) hierarchical page tables (d) two-level paging