※ 注意：第(一)(二)大題請用 2B 鉛筆作答於答案卡，並先詳閱答案卡上之「畫記說明」。

(一) **True and False** 是非題 (每題 2.5 分, 答錯倒扣)

1. Symbol table matches names of labels to the addresses of the memory words that instructions occupy. Assemblers keep track of labels used in branches and data transfer instructions in the symbol table.
(A) True (B) False

2. Java programming language uses a software interpreter called Java Virtual Machine(JVM) to translate the interpreted code segments into native code of the computer at runtime.
(A) True (B) False

3. The accuracy in floating point is normally measured with ULP(units in the last place). ULP (units in the last place) is defined as the number of bits in error in the LSBs of the significand between the actual number and the number that can be prepresented.
(A) True (B) False

4. In low power CPU design, the usage of low clock rates allows a processor to sleep and conserve power since CMOS technology does not consume power when it is idle.
(A) True (B) False

5. If a branch is taken, the branch target address specified in a branch, which becomes the new PC. For example, the branch target is given by the sum of the offset field of the instruction and the address of the instruction following the branch.
(A) True (B) False

6. Micro-instruction is an advanced pipelining technique that enables the processor to execute more than one instruction per clock cycle.
(A) True (B) False

7. Virtually addressed cache is a cache that keeps track of recently used address mappings to avoid an access to the page table.
(A) True (B) False

8. Non-blocking cache is used to hide the cache miss latency by using out-of-order processors. Hit under miss allows additional cache hits during a miss. Miss under miss allows multiple outstanding cache misses.
(A) True (B) False

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9. The alternative of dedicated I/O instructions in the processor is to use memory-mapped I/O. The memory-mapped I/O assigns a memory address for a command to an I/O device and records the device number.
(A) True (B) False

10. DMA (direct memory access) mechanism uses the DMA controller as bus master to directly read or write memory without using processor. As a result, the DMA mechanism could reduce the occupancy of the processor cycles.
(A) True (B) False

11. RAID 1 has the highest check disk overhead among RAID levels 1,3, and 5. On the other hand, RAID 3 and 5 have the same throughput for large writes.
(A) True (B) False

12. Split transaction protocol is used for bus design. The protocol releases during a bus transaction while the receiver is waiting for the data to be transmitted, which frees the bus for access by another receiver.
(A) True (B) False

（二）選擇題 (每題 2.5 分, 單選題，答錯不倒扣)

13. Suppose we have two processes with indices 0 and 1. Assume that **count** is a shared variable between the two processes with initial value zero. (Suppose **count** is implemented without limit in its range.) Also each process with index p has a local variable **ticket**[p] with initial value zero. We have the following mutual-exclusion algorithm for the two processes in a distributed system.

```
while (true) {
  ticket[p] = count = count + 1;
  while (ticket[1-p] != 0 && ticket[1-p] < ticket[p]) ;
  /* critical section. */
  ticket[p] = 0;
  /* remainder section. */
}
```

We assume that each line of statement in the algorithm is atomic. We then have the following propositions of the algorithm.
a: The algorithm satisfies the mutual exclusion property.
b: The algorithm satisfies the progress property.
c: The algorithm satisfies the bounded waiting property.
If the algorithm satisfies a proposition, say k, then k is 1. Otherwise k is zero.
What is the value of (2*a+b)*3+c ? (A) 0 (B) 1 (C) 6 (D) 7 (E) 10.

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14. Assume that the algorithm in question 13 in the above is run in a distributed environment. The two processes are run on two different computers while variable **count** is kept by a third computer. Thus to query the value of a variable at a remote site, we need two messages, one for the sending the query and the other for receiving the query result. What is the number of messages received and sent by process 0 in one iteration of the outer while-loop in the algorithm ? (A) 2 (B) 4 (C) 6 (D) 8 (E) None of the above.

15. We have a hard disk with block size 512 bytes. A block address is two bytes long. We use linked blocks of index tables to record the blocks in a file. All byte numbers, block numbers, index table numbers, and table indices are numbered from zero and up. Thus the first byte in a file is byte zero. The first block in a file is block zero. Now we want to read byte 779988 in a file. What is the number of the index table that contains the block address of this byte ? (A) 2 (B) 5 (C) 1523 (D) 3046 (E) none of the above.

16. For question 15 in the above, we now want to read byte 203869. What is the number of the block in the index table for this byte ? (A) 143 (B) 286 (C) 398 (D) 799 (E) None of the above.

17. To detect the occurrence of deadlocks with the Banker's algorithm, we have a resource allocation system with the following state.

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

Let the Need matrix be as follows.

	Need			
	A	B	C	D
P0	a	b	c	d
P1	e	f	g	h
P2	i	j	k	l
P3	m	n	o	p

What is the value of `((a*2+f)*3+k)*5+p` ? (A) 75 (B) 120 (C) 135 (D) 137 (E) None of the above.

18. Suppose Pa Pb Pc Pd is a safe sequence for the state described in question 17 in the above with a,b,c,d∈{0,1,2,3}. What is the value of ((a*2+b)*3+c)*5+d ? (A) 28 (B) 32 (C) 38 (D) 47 (E) 63.

19. In question 17 in the above, after three processes have released their resources, the available vector becomes a b c d. What is the value of `((a*2+b)*3+c)*5+d` ? (A) 199 (B) 220 (C) 341 (D) 362 (E) 385.

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20. We have a disk using the SCAN scheduling algorithm. The disk has 100 tracks indexed from 0 to 99. Now the disk head is at track 50 and moving toward track 51. Suppose now the disk receives requests to access tracks 39, 7, and 81. What is the moving distance of the disk head for these requests ? (A) 105 (B) 117 (C) 131 (D) 137 (E) 141.

21. In a database system, we have the following schedule for 3 transactions.

```
time 0     1       2      3       4       5      6       7
     TS(1) W(1,A) TS(2) R(2,A) TS(3)  R(1,A) W(3,A) W(2,B)
```

TS(k) means transaction k starts. W(k,x) means transaction k writes to variable x. R(k,x) means that transaction k reads variable x. Suppose we use time-stamp based protocol to schedule the transaction operations. What is the value of W-timestamp(A) immediately after time 7 ? (A) 0 (B) 1 (C) 2 (D) 3 (E) 4.

22. Continued from question 21 in the above, which of the following schedules is serializable ?

time	1	2	3	4	5
(A)	W(1,A)	W(1,B)	W(2,A)	R(3,B)	R(1,A)
(B)	W(1,A)	W(3,A)	W(3,B)	R(2,A)	R(1,B)
(C)	W(1,A)	W(2,A)	W(1,B)	R(3,B)	R(1,B)
(D)	W(1,A)	W(2,B)	W(2,A)	R(3,B)	R(1,B)
(E)	W(1,A)	W(2,B)	W(3,A)	R(3,B)	R(2,A)

23. Assume that we have the following CPU tasks in a preemptive Shortest-Remaining-Time First scheduling system.

id	arrival time	CPU time
P0	0	3
P1	1	7
P2	5	4

What is the average waiting time ? (A) 2 (B) 7/3 (C) 8/3 (D) 3 (E) 10/3.

24. For the tasks in question 23 in the above, suppose now the scheduling algorithm is round-robin with quantum = 3. What is the average response time ? (A) 1 (B) 4/3 (C) 5/3 (D) 7/3 (E) 8/3.

25. In a demand paging system, the average page hit ratio is 0.998. The memory access time is 10^{-9} sec while the time to swap-in-and-out pages in memory miss is 300×10^{-6} sec. What is the effective memory access time ? (A) 6.998×10^{-9} sec. (B) 30.998×10^{-9} sec. (C) 60.998×10^{-9} sec. (D) 300.998×10^{-9} sec. (E) 600.998×10^{-9} sec.

26. Assume that we use an LRU page-replacement algorithm for a process running with four frames indexed from 0 to 2. Assume that when there is an empty frame, we always fill in the empty one with the smallest frame index. Now we have the following page reference sequence: 0, 1, 2, 3, 4, 0, 2, 1, 0, 3 to the page indices. Assume that after the reference, frames 0, 1, and 2 respectively contain pages a, b, and c. What is the value of (a*2+b)*3 + c ? (A) 5 (B) 15 (C) 21 (D) 24 (E) None of the above.

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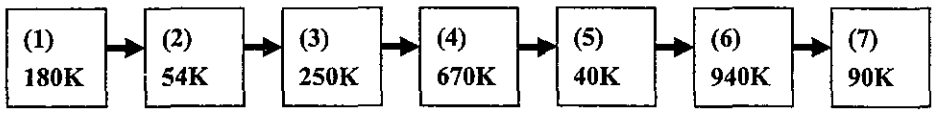
27. Continued from question 26 in the above, now assume that we use the second-chance algorithm. Also the number of frames is 4 now. Assume that after the reference, frames 0, 1, 2, and 3 respectively contain pages a, b, c, and d. For convenience, we assume that every time we search for a target frame, we start from frame 0. What is the value of ((a*2+b)*3 + c)*5+d ? (A) 28 (B) 32 (C) 38 (D) 43 (E) 77.

28. Assume that we have the following list for the free blocks in a contiguous allocation memory system with the best-fit algorithm.



Now we have the following memory space request in sequence: 80k, 30k, 5k, 103k. Suppose the best-fit algorithm tells us to use block (a), (b), (c), and (d) in sequence. What is the value of ((a*2+b)*3+c)*5+d ? (A) 256 (B) 296 (C) 306 (D) 311 (E) 321.

29. In which of the following time, physical address binding to variables in a program cannot happen ? (A) coding time (B) compilation time (C) loading time (D) execution time (E) None of the above.

30. Which of the following technologies are not designed to overcome the low efficiency incurred by large page table sizes. (A) limit register (B) TLB (C) inverted page tables (D) hierarchical paging (E) hashed page tables.

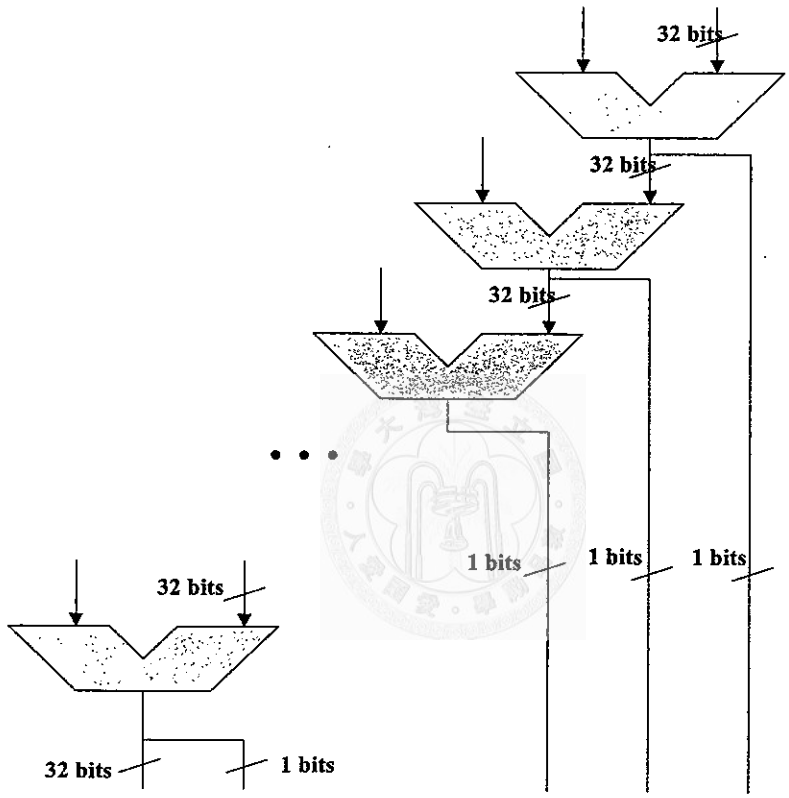
31. Which of the following statements is false ?
(A) Working set theory can be used to control the level of multiprogramming.
(B) System calls are executed with privileged instructions which are not supposed to be used by user programs.
(C) The memory hierarchy does not always guarantee efficiency in information retrieval.
(D) In practice, the SJF scheduling algorithm may not be optimal in average waiting time.
(E) The technology of virtual memory system may fail for some specific CPU instruction sets.

32. Which of the following is not a necessary condition for the happening of a deadlock ? (A) mutual exclusion to resources (B) resources not released by a terminated process (C) resource hold and wait by processes (D) resource allocation without preemption (E) circular waiting in the resource allocation graph.

見背面

（三）問答題　（本大題請作答於試卷上「非選擇題作答區」，並應註明作答之題號。）

1. (10 分)What is the functionality of the following design? What is the benefit of this design?



2. (10 分) What is Layer 3 protocol in OSI model? Briefly describe the functionality of Layer 3 protocol. Give an example of a commonly used Layer 3 protocol in current network.

試題隨卷繳回