

逢甲大學101學年度碩士班招生考試試題 編號：060 科目代碼：

科目	計算機概論	適用系所	資訊工程學系	時間	100 分鐘
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※請務必在答案卷作答區內作答。

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壹、Choose an appropriate answer for each question. 40%

- (1). Which of the following descriptions is incorrect? (A) Operational semantics is the most rigorous and most widely known method for describing the meaning of programs (B) An attribute grammar is a descriptive formalism that can describe both the syntax and static semantics of a language (C) Proving the correctness of programs with while loops using axiomatic semantic can be difficult (D) In denotational semantics, mathematical objects are used to represent the meanings of language constructs (E) None of the above.
- (2). The digital signature method does not provide (A) Confidentiality (B) Authentication (C) Nonrepudiation (D) Integrity (E) None of the above.
- (3). Which of the following descriptions for a general linear list is incorrect? (A) The elements are not of the same type (B) The elements are arranged sequentially (C) Each element is a record with a key field (D) The elements are sorted based on some attribute (E) None of the above.
- (4). What is the equivalent decimal value to the internal data representation C2C40000 (in hexadecimal), if the data is stored on a 32-bit computer system that uses the IEEE-754 standard? (A) -98.0 (B) -3.0625 (C) -49.0 (D) -34.0 (E) None of the above.
- (5). Unicode divides the whole code space into multiple planes. Which plane is designed to be compatible with the previous 16-bit Unicode? (A) Basic Multilingual Plane (B) Supplementary Ideographic Plane (C) Supplementary Special Plane (D) Supplementary Multilingual Plane (E) None of the above.
- (6). What is the final result will be stored into the string variable (string_var), as we execute the scanf("%9s", string_var) statement and enter the character string "Janu Febr March" (not involve the quotation marks)? (A) Janu (B) J (C) Janu Febr (D) Janu Febr March (E) None of the above.
- (7). Which of the following is not an auxiliary protocol used in IP for compensating its deficiencies? (A) UDP (B) ICMP (C) ARP (D) IGMP (E) None of the above.
- (8). Which of the following is a supplementary protocol that allows non-ASCII data to be sent through SMTP? (A) MIME (B) IMAP (C) POP3 (D) FTP (E) None of the above.
- (9). Which of the following is not an in-out-mode parameter transmission method? (A) Call by Value (B) Call by Reference (C) Call by Name (D) Call by Value-Result (E) None of the above.
- (10). Which of the following would not be the most commonly used algorithms in CPU scheduling? (A) FCFS (B) SSTF (C) SRT (D) Multiple level queues (E) None of the above.
- (11). Which of the following is a graphical language used for specifying, visualizing, constructing, and documenting software and hardware systems? (A) Visual Basic (B) UML (C) HTML (D) XML (E) None of the above.

- (12). Which kind of the following sorting algorithms moves the smallest item to the beginning of the unsorted list, and there is no one-to-one swapping? (A) selection sort (B) bubble sort (C) quick sort (D) insertion sort (E) None of the above.
- (13). Which of the following descriptions concerning with pointers in C and C++ is incorrect? (A) Pointer arithmetic is possible (B) The design offers solutions to the dangling pointer or lost heap-dynamic variable problems (C) Pointers can point at any variable (D) Pointers can point anywhere in memory, whether there is a variable there or not (E) None of the above.
- (14). Which of the following is not the normal form used in the normalization process with relational databases? (A) PJNF (B) BNF (C) BCNF (D) 5NF (E) None of the above.
- (15). What is an instruction in a high level language that is equivalent to a specific set of one or more ordinary instructions in the same language? (A) Microcode (B) Macro (C) Pseudo code (D) Query instruction (E) None of the above.
- (16). What is the missing factor (the question mark) in the following recursive definition of the maximum number of nodes based on the height of a binary tree? (A) $2H - 1$ (B) $2H-1$ (C) $2H$ (D) $2H-1$ (E) None of the above.

$$N(H) = \begin{cases} 1 & \text{if } H = 1 \\ N(H-1) + ? & \text{if } H \geq 2 \end{cases}$$

- (17). Which of the following protocols has no real configurable parameters, and is an excellent protocol for networking small offices or homes, but it does not expand well into larger environments? (A) TCP/IP (B) NetBEUI (C) IPX/SPX (D) ICMP (E) None of the above.
- (18). Which of the following would not be the most commonly used database model today? (A) Distributed database (B) Hierarchical database (C) Relational database (D) Object-oriented database (E) None of the above.
- (19). Which of the following is not the basic type of multiprocessor operating system? (A) Separate supervisor (B) Networking (C) Master-slave (D) Symmetric (E) None of the above.
- (20). Which of the following constructs or statements should not be involved in structured programming? (A) for-loop constructs. (B) Nested-if constructs (C) goto statement (D) Procedure call statement (E) None of the above.
- (21). Which of the following task is not the transport layer in TCP/IP protocol responsible for? (A) Carrying out congestion control (B) Multiplexing/demultiplexing outgoing/incoming messages (C) Providing services to the user (D) Carrying out flow control (E) None of the above.
- (22). What is a form of I/O in which a special device controls the exchange of data between memory and I/O devices? (A) Memory-map I/O (B) Isolated I/O (C) DMA (D) Interrupt I/O (E) None of the above.
- (23). Which of the following is not the one of security goals that are defined by Eugene et al. in information security? (A) Availability (B) Confidentiality (C) Reliability (D) Integrity (E) None of the above.
- (24). Which of the following is the prefix expression equivalent to the given postfix expression: $AB*CD/+EF-*$? (A) $(A*B+C/D)*(E-F)$ (B) $A*B+C/D*E-F$ (C) $**AB/CD-EF$ (D) $*-AB+*CD/EF$ (E) None of the above.

- (25). What is a measure of how tightly two modules are bound to each other? (A) Modularity (B) Cohesion (C) Coupling (D) Interoperability (E) None of the above.
- (26). Which of the following descriptions is incorrect? (A) Scanning, parsing, and code generation are three main steps in the compilation process (B) The grammar does not describe the semantics, or meaning, of the various statements (C) Finite automata can easily represent limitations on the length of strings being recognized. (D) BNF(Backus-Naur Form) is not the most powerful syntax description tool available (E) None of the above.
- (27). Which of the following sets of values constitutes a valid RSA public key encryption system? (A) $p = 5, q = 11, n = 83, e = 10, d = 13$ (B) $p = 5, q = 11, n = 83, e = 17, d = 13$ (C) $p = 5, q = 11, n = 55, e = 17, d = 13$ (D) $p = 5, q = 11, n = 55, e = 10, d = 13$ (E) None of the above.
- (28). Which of the following is called a consensus theorem in Boolean Algebra? (A) $XY + XY' = X$ (B) $(X+Y)(X'+Z) = XZ + X'Y$ (C) $(X+Y+Z+...)' = X'Y'Z'...$ (D) $XY + YZ + X'Z = XY + X'Z$ (E) None of the above.
- (29). Which of the following descriptions is incorrect? (A) IEEE 802.11 is a set of standards for implementing wireless local area network (WLAN) computer communication. (B) 802.11n operates on both the 2.4 GHz and 5 GHz frequency bands. (C) IEEE 802.16 is also known as WiMax in industry (D) CSMA/CD is a standard medium access method used in wireless network. (E) None of the above.
- (30). Which of the following is not a collision resolution method in hashing operation? (A) Open addressing resolution (B) Linked list resolution (C) Bucket hashing (D) Direct hashing (E) None of the above.
- (31). Which of the following RAID level is the most common parity RAID system? (A) RAID-2: memory-style error-correcting codes (B) RAID-4: block-interleaved parity (C) RAID-3: bit-interleaved parity (D) RAID-5: block-interleaved distributed parity (E) None of the above.
- (32). Which kind of the following attacks does not threaten the integrity of information? (A) Repudiation (B) Replaying (C) Masquerading (D) Denial of Service (E) None of the above.
- (33). Which of the following is not an example of linear block codes? (A) Reed-Solomon codes (B) Parity-check codes (C) Hamming codes (D) CRC (E) None of the above.
- (34). Which of the following descriptions is incorrect? (A) MD5 is not suitable for digital signature application. (B) AES is a symmetric-key block cipher. (C) In asymmetric-key cryptography, numbers are manipulated. (D) A digital signature uses the private and public keys of the recipient. (E) None of the above.
- (35). Which of the following operations creates an overflow if the numbers and the result are represented in 8-bit two's complement representation? (A) $11000010 + 00111111$ (B) $00000010 + 00111111$ (C) $11000010 + 11111111$ (D) $00000010 + 11111111$ (E) None of the above.
- (36). Which of the following descriptions is incorrect? (A) AVL tree is a binary tree that consists of two AVL subtrees, whose heights differ by no more than one (B) AVL tree is a balanced search tree (C) The search effort of AVL tree is $O(\log_2 n)$, where n means the number of nodes in the tree (D) AVL trees are also known as height-balanced trees (E) None of the above.

- (37). Which of the following descriptions with the SQL is incorrect? (A) A language that is standardized by the ANSI and ISO for use on relational databases (B) is a declarative language (C) first implemented by the Oracle Corporation in 1979 (D) select, insert, difference, and project are all operations defined by the SQL (E) None of the above
- (38). Which of the following is not the advantage for a database system? (A) It is easier to maintain confidentiality (B) It is more efficient than a flat file system (C) It is easier to maintain data integrity (D) It is easier to avoid data inconsistency (E) None of the above.
- (39). Which of the following algorithms would not be the most commonly used seek strategy for the I/O device handler? (A) FCFS (B) SSTF (C) C-LOOK (D) SCAN (E) None of the above.
- (40). Which of the following descriptions is incorrect? (A) Linkage editors perform linking operations at compile time (B) Linking loaders perform linking operations at load time (C) Dynamic loading postpones the linking function until execution time (D) The resolution of external references and library searching are only performed once in linkage editors (E) None of the above.

貳、How many additions of bits and shifts of bits are used to multiply a and b using the following algorithm? (please show your answer in $O(?)$ notation) 4%

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Procedure multiply ( $a, b$ : positive integer)
{the binary expansions of  $a$  and  $b$  are  $(a_{n-1}a_{n-2}\dots a_1a_0)_2$ 
  and  $(b_{n-1}b_{n-2}\dots b_1b_0)_2$ , respectively}
for  $j := 0$  to  $n-1$ 
begin
  if  $b_j = 1$  then  $c_j := a$  shifted  $j$  places
  else  $c_j := 0$ 
end
{ $c_0, c_1, \dots, c_{n-1}$  are the partial products}
 $p := 0$ 
for  $j := 0$  to  $n-1$ 
   $p := p + c_j$ 
{ $p$  is the value of  $ab$ }

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參、Consider the scenario shown in the following table? Is the system deadlock free? 2%

Event	Action
1	Process-1 (P1) requests and is allocated Resource-1 (R1)
2	P1 requests and is allocated R2
3	P2 requests R1
4	P3 requests and is allocated R3
5	P1 releases R1, which is allocated to P2
6	P3 requests R2
7	P1 releases R2, which is allocated to P3

肆、Consider the following page reference string:

1, 2, 3, 4, 1, 5, 4, 2, 6, 7, 4, 6, 1, 5

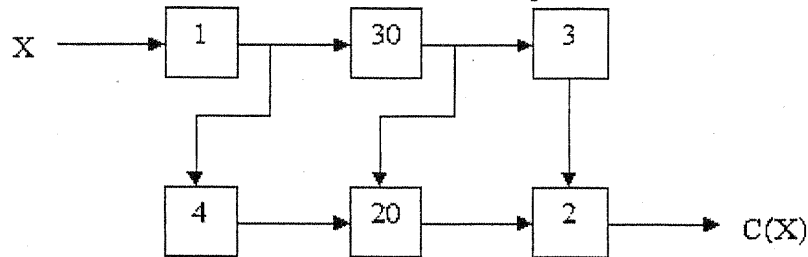
How many page faults would occur if the FIFO and the second-chance replacement algorithm is applied, respectively? Assume four frames are provided in physical memory and all frames are initially empty. 4%

伍、(14%) Multiple-choice questions:

- (1). Which of the following is usually observed in a complex computer system? (A) The underlying technology has a high rate of change. (B) It has a large number of interacting features. (C) It is easy to write a succinct description of the behavior of the system. (D) It exhibits emergent properties. (E) None of these.
- (2). A process in UNIX operation system (A) May be created only using the fork system call, except for the init process. (B) Can inherit file descriptors from its parent to facilitate inter-process communication. (C) Has a different address space from its parent. (D) Must have a shell as an ancestor process. (E) None of these.
- (3). A Karnaugh map can't represent more than 2 variables along a single dimension because (A) Gray code counts can't go beyond 2 bits. (B) Each value v along a dimension must be adjacent to all values that are Hamming distance 1 from v . (C) Three is not a power of two. (D) No reason. You can represent 3 variables along a dimension. You couldn't make 5-variable K-maps otherwise. (E) None of these.
- (4). In general, if we take a combinational circuit and pipeline it using ideal (zero delay, zero setup/hold time) registers, which one of the following statements best describes the resulting change in the circuit's latency and throughput: (A) The throughput may improve but the latency definitely does not. (B) Both the throughput and latency may improve. (C) The throughput definitely improves and the latency definitely gets worse. (D) The latency may improve but the throughput definitely does not. (E) The throughput definitely improves and the latency definitely does not.
- (5). Which of the following can be performed by a finite state machine (FSM)? (A) When the last 277 digits entered have been alternate 1s and 0s. (B) When more 0s than 1s have been entered. (C) When the number entered thus far is divisible by 3. (D) When an odd number of 1s and an even number of 0s have been entered. (E) None of these.
- (6). If a cache access requires one clock cycle and handling cache misses stalls the processor for an additional five cycles, which of the following cache hit rates comes closest to achieving an average memory access of 2 cycles? (A) 75% (B) 80% (C) 83% (D) 86% (E) 98%
- (7). In a non-pipelined single-cycle-per-instruction processor with an instruction cache, the average instruction cache miss rate is 5%. It takes 8 clock cycles to fetch a cache line from the main memory. Disregarding data cache misses, what is the approximate average CPI (cycles per instruction)? (A) 0.45 (B) 0.714 (C) 1.4 (D) 1.8 (E) 2.22

陸、(6%) The FCU-2012 CPU contains a pipeline that uses six stages: Fetch, Decode, Load Arguments, Execute, Writeback, and Update. This pipeline processes instructions at a rate of one stage per clock cycle. What is the total number of cycles to accomplish 10 instructions using a non-pipelined approach? What is the total number of cycles to accomplish 10 instructions using a pipelined approach with assumption that the pipeline is empty to begin with?

柒、(12%) Consider the following combinational logic circuit constructed from 6 modules. In the diagram below, each combinational component is marked with its propagation delay in seconds.

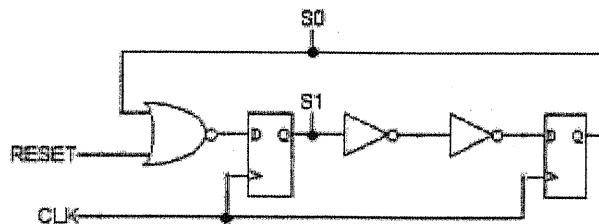


- (1). What is the latency and throughput of this combinational circuit?
- (2). Redraw the above circuit to place the *smallest* number of ideal (zero delay, zero setup/hold time) pipeline registers so as to maximize its throughput. Remember to place a register on the output.
- (3). What is the latency and throughput of your pipelined circuit?

捌、(6%) **Simplify** the following Boolean expression using Karnaugh map and **implement** it with **minimum** number of NAND gates only in two-level circuits:

$$F = ABC'D + AB'C'D' + A'B'CD + A'BCD' + AC$$

玖、(12%) A Finite-State Machine with two state bits, S0 and S1 is implemented in the following circuit diagram:



inverter: $t_{CD}=1\text{ ns}$, $t_{PD}=2\text{ ns}$

nor2: $t_{CD}=1.5\text{ ns}$, $t_{PD}=2\text{ ns}$

D register: $t_{CD}=0\text{ ns}$, $t_{PD}=2\text{ ns}$, $t_H=1\text{ ns}$, $t_S=3\text{ ns}$

- (1). What is the smallest clock period for which the circuit still operates correctly?
- (2). When the RESET signal is set to "1" for several cycles, what state is the FSM set to? (Give values for S0 and S1.)
- (3). Assuming the RESET signal has been set to "0" and will stay that way, what is the state following S0=1 and S1=1?