PHIL – IT GENERAL CERTIFICATION EXAM

I. FUNDAMENTALS

DISCRETE MATH

EASY

1. What is the relationship of the statements $p \rightarrow q$ and $\sim q \rightarrow \sim p$?
   a. They are equal.
   b. They are equivalent.
   c. They are different.
   d. They are not equal.

2. What is the conjunction form of the statement $\sim(p \rightarrow q)$?
   a. $p \wedge q$
   b. $\sim p \wedge q$
   c. $\sim p \wedge \sim q$
   d. $p \wedge \sim q$

3. Which of the statements is a tautology?
   a. $p \wedge q$
   b. $p \vee q$
   c. $\sim p \vee p$
   d. $p \wedge T$ where T is a true statement

4. Let R be a relation on a set A. If $\forall a,b,c \in A$, aRb, and bRc then aRc, what is the type of relation?
   a. symmetric
   b. transitive
   c. reflexive
   d. asymmetric

5. What is the equivalent of A – B?
   a. $A \cap B^c$
   b. $A^c \cap B$
   c. $A \cup B^c$
   d. $A^c \cup B$

6. What is an example of a 1-1 function?
   a. $f(x) = 2x$
   b. $f(x) = |x| + 1$
   c. $f(x) = x^2$
   d. $f(x) = \sin x$

AVERAGE

7. What is the next element in the sequence 1,3,6,10,15,21,…?
   a. 22
   b. 28
   c. 29
   d. 25

8. If p and r are false and q and s are true then which statement is true?
   a. $p \rightarrow q$
   b. $(q \wedge s) \rightarrow r$
   c. $(p \rightarrow r) \rightarrow s$
   d. $(q \vee p) \wedge s$

9. What is the cardinality of power set of a set with 6 elements?
   a. 6
   b. 12
   c. 32
   d. 64

10. What is the 10^{th} element in the Fibonacci sequence 0,1,1,2,3,5,…..?
   a. 55
   b. 34
   c. 8
   d. 21

11. How many subsets for a set of 10 elements?
   a. 20
   b. 100
   c. 512
   d. 1024

12. How many arrangements of 5 colored beads to form a bracelet?
   a. 24
   b. 120
   c. 12
   d. 5

13. What must be the value of n in the equation P(n,2)?
   a. 1
   b. 10
   c. 11
   d. 2

14. What is the value of n to make combination problem true?
   C(n, 5) = C(n, 2)
   a. 7
   b. 2
   c. 8
   d. 3

15. What is the equivalence relation(as a set of ordered pairs) on {a,b,c,d,e} whose equivalence classes are {a},{b,c,e}, {d}?
   a. { (a,a), (b,c), (c,e), b,e), (d,d)}
   b. { (a,b), (b,c), (c,d), (d,e), (e,a)}
   c. { (a,a), (b,c), (c,e), b,e), (c,b), (e,c), (e,b), (d,d)}
   d. { (a,a), (b,b), (c,c), (e,e) , (d,d)}

16. How many elements in A cross product B if A has p elements and B has q elements?

a. p + q
b. p – qd
c. p x q
d. p / q

17. What is the value of n if P(n,2) = 72?
a. 70
b. 68
c. 9
d. 36

18. Given that the relation {(1,1), (2,2), (3,3), (4,4), (1,2), (2,1), (3,4), (4,3)} is an equivalence relation on {1,2,3,4}, what is the equivalence class [3] containing 3?
a. {3}
b. {1,2,3,4}
c. {3,4}
d. {1,2,3}

19. Which of the following expressions (where c means complement) exhibit the De Morgan's Laws?
a. $(A \cup B)^c = A^c \cup B^c$
b. $(A \cup B)^c = A^c \cap B^c$
c. $(A \cap B)^c = A^c \cap B^c$
d. $(A \cap B)^c = A^c - B^c$

20. Which of the following matrix relations represents a symmetric relation?(???)

a. $M_R = \begin{pmatrix} 1 & 0 & 1 \\ 1 & 1 & 0 \\ 1 & 1 & 1 \end{pmatrix}$

c. $M_R = \begin{pmatrix} 1 & 1 & 1 \\ 1 & 0 & 1 \\ 0 & 1 & 1 \end{pmatrix}$

b. $M_R = \begin{pmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{pmatrix}$

d. $M_R = 0\ 1\ 1 \begin{pmatrix} 1 & 1 & 1 \\ 0 & 0 & 0 \end{pmatrix}$

DIFFICULT

21. The English alphabet contains 21 consonants and 5 vowels. How many strings of six lowercase letters of the English alphabet contain exactly one vowel?
a. 122523030
b. 223149655
c. 72930375
d. 106626625

22. In how many ways can a committee of 5 persons be selected from a club of 3 men and 4 women?
a. 7
b. 42
c. 21
d. 5

PROGRAMMING FUNDAMENTALS
EASY

23. What are local variables?
    a. Declared outside any function.
    b. Data that are supplied during a function call.
    c. Declared inside a function.
    d. Defined using the #define preprocessor.

24. What variable can be accessed by any function in a program?
    a. local variable
    b. global variable
    c. dependent variable
    d. international variable

25. Which of the following statements is NOT true about an array?
    a. It contains the address of the first array element.
    a. It is a pointer.
    b. It stores all the array elements.
    c. It is the base address of the array in memory.

26. What is a return statement?
    a. Transfers control of execution out of the function.
    b. Passes two values to the calling function.
    c. Transfer the flow of the program to a labeled statement.
    d. Immediately terminates the execution of a loop.

AVERAGE

27. typedef struct studInfo{
    char stuNo[15];
    char name[50];
    char course[50];
    int yearLevel;
    };
    main( ){
    studInfo studArray[15];
    //1
    }

    What is the correct way of assigning the value 4 to the yearLevel field of the last student in the array studArray?
    a. studArray.yearLevel[15] = 4;
    b. studArray[14].yearLevel = 4;
    c. studArray.yearLevel[14] = 4;
    d. studArray[15].yearLevel = 4;

28. A function summation is expected to return the total of all the numbers in an integer array passed to it. Let the first argument be the array and the second parameter be the number of elements in the array. What is the correct definition of the function described in the previous statements?

a.
```
void summation(int array[ ], int numElements ){
  int total = 0, loop;
     for( loop = 0; loop < numElements; loop++ )
          total = total + array[loop];
}
```

b.
```
int summation( int array[ ], int numElements ) {
  int total = 0, loop;
  for( loop = 0; loop <= numElements; loop++ )
       total = total + array[loop];
  return total;
  }
```

c.
```
int summation( int array[ ], int numElements ) {
  int total = 0, loop;
  for( loop = 0; loop < numElements; loop++ )
       total = total + array[loop];
  return total;
  }
```

d.
```
int total( int array[ ], int numElements ) {
  int total, loop;
  for( loop = 0; loop < numElements; loop++ )
       total = total + array[loop];
  return total;
  }
```

29. Consider int num[50] where the base address of the array is 7050h, what is the address of the 10th array element?

a. 7064h
b. 7060h
c. 7062h
d. 705Ah

30. What is the output of the program below?

```
#include<stdio.h>
int utility(int x, int y);
main(){
int result=utility(3,5);
printf("%d",result);
}
int utility(int x, int y){
  int result = x%y;  // the % symbol is used as the modulo operator which
   return result;       // returns the remainder after an integer division
 }
```

a. 3
b. 5
c. 2
d. compilation error

31. #include<stdio.h>

```
void pass(int x, int y){
   x = ++x + y--;
}

void main( ){
  int x=10, y=20;
  pass(x,y);
  printf("x= %d and y = %d",x,y);

}
```

What is the output of the program above?

a. x = 11 and y = 19
b. x = 11 and y = 20
c. x = 10 and y = 20
d. x = 10 and y = 19

32. What is the output of the program below?

```
#include<stdio.h>

int x(int a, int b);

void main( ){
  int z=2, y=3;
  x(z,y);
 printf("%d and %d", z,y);
}

void x(int a, int b){
  a + = b;
  b++;
}
```

a. 6 and 3
b. 5 and 4
c. 5 and 3
d. compilation error

33. What is the output of the following program below?

```
#include<stdio.h>
void main()
{
   int a, b;
   for( a=5; a>=1; a--)
   {
      for(b=5; b>=a; b--)
            printf("%d", a);
      printf("  ");
   }
}
```

a. 54321 4321 321 21
b. 544333222211111
c. 5 44 333 2222 11111
d. 5 4 4 3 3 3 2 2 2 2 1 1 1 1 1

34. What is the output of the program below?

```
int sample(int x);
void main( ){
  printf("%d%d%d\n", sample(2), sample(1) sample(5));

}
int sample(int x){
int x =0;
switch(x){
 case 1 : x=1;
 case 2: return 2;
 case 3: x=3;
 case 4: return 4;
 default: x = 5;
}
return x;
}
```

a. 214
b. 224
c. 215
d. 225

35. What is the output of the program below?

```
#include<stdio.h>
#include<string.h>

int h(char name[50]);
void main( ){
 char n[50];
strcpy(n, "University of Indonesia");
 int x = h(n);
printf("%d", x);
}
int h(char name[50]){
if (name[0] = = 'A'  ||  name[0] = = 'E' ||  name[0] = = 'I' ||  name[0] = = 'O' ||  name[0] = =
'U')
    return 0;
else
   return 1;

}
```

a. 0
b. 1
c. 2
d. compilation error

DIFFICULT

36. What is the output of the program below?

```
#include<stdio.h>
int function(int x, int y);
void main( ){
   int x = function(2,5);
  printf("%d", x);
}

int function(int x, int y){
int n = 0;
  for (int i=1; i<=100; i++)
   {
     if (i = = (x + y))
     {
                 break;
     }
      n += (i % 3);
  }
 return n;
}

}
```

a. 3
b. 5
c. 6
d. 7

37. What is the output of the program below?

```
#include<stdio.h>
int looping ( );

void main(){
printf("%d", looping(2,3));
}
int looping( ){
 int n = 0;
 int i = 1;
          while (i < 4) {
                    n++;
                    i++;
          }
return n;
}
```

a. 3
b. 5
c. 6
d. compilation error

38. A function named search accepts three arguments namely an array of integers, the size of the array, and the integer in which to search form the array. The function should then return 1 if the integer is found and 0 otherwise. What is the correct way to define the function?

a.
```
void search(int array[ ], int size, int x){
int result = 0;
for(int i=0; i<=size; i++){
  if(array[i] = = x){
    result = 1;
    break;
 }
}
return result;
}
```
b.
```
void search(int array[ ], int size, int x){
int result = 0;
for(int i=0; i<size; i++){
  if(array[i] = = x){
    result = 1;
    break;
 }
}
return result;
}
```
c.
```
int search(int array[ ], int size, int x){
int result = 0;
for(int i=0; i<=size; i++){
  if(array[i] = = x){
    result = 1;
    break;
 }
}
return result;
}
```
d.
```
int search(int array[ ], int size, int x){
int result = 0;
for(int i=0; i<size; i++){
  if(array[i] = = x){
    result = 1;
    break;
 }
}
return result;
}
```

39. What is the output of the program below?

```
#include<stdio.h>
void display(int c[5]);
void main( ){
   int x[ ] = {3,5,4,10,8};
  display(x);
}
void display(int c[5]){
 for(int i=0;i<5;i++){
   if((c[i]%2) = = 0);
       printf("1")
  else
      printf("0");
 }

}
```

a. 10101
b. 00101
c. 00111
d. 11000

40. Which of the following functions defined below displays the output 15423, if the actual parameter passed to it is 32451?

a.
```
void reverse(int x){
while(x>=0){
  printf("%d", (x%10));
  x = x/10;
      }
}
```

b.
```
void reverse(int x){
while(x<0){
  printf("%d", (x%10));
  x = x/10;
      }
}
```

c.
```
void reverse(int x){
while(x<=0){
  printf("%d", (x/10));
  x = x % 10;
      }
}
```

d.
```
void reverse(int x){
while(x>=0){
  printf("%d", (x/10));
  x = x%10;
      }
}
```

41. Which statement is TRUE about the function defined below?

```
int max(float array[], int size){
  float x = array[0];
  int indx = 0;
  int i = 0;
  while(i<size){
    if(array[i] > x){
       x = array[i];
      ind = i;
     }
    i++;
}
 return ind;
}
```

a. The function returns the largest number in the array.
b. The function returns the value in the array that is greater than the first array element.
c. The function returns the index of the number in the array that is greater than the first array element.
d. The function returns the index of the largest number in the array.

42. Which of the following program will display the number 6 in the screen?

a.
```
#include<stdio.h>
int func(int a);
void main( ){
int x = func(3);
printf("%d", x);

}
int func(int a){
  if(a= = 0)
     return 0;
 else
    return a + func(a-1);
}
```

b.
```
#include<stdio.h>
int func(int a);
void main( ){
int x = func(3);
printf("%d", x);

}
int func(int a){
  if(a= = 0)
     return 0;
 else
    return a - func(a-1);
}
```

c.
```
#include<stdio.h>
int func(int a);
void main( ){
int x = func(3);
printf("%d", x);
}
int func(int a){
  if(a= = 0)
     return 1;
 else
    return a + func(a-1);
}
```

d.
```
#include<stdio.h>
int func(int a);
void main( ){
int x = func(2);
printf("%d", x);

}
int func(int a){
  if(a= = 0)
     return 0;
 else
    return a + func(a-1);
 }
```

PROFESSIONAL ETHICS
AVERAGE:

43. While the operational audit is ongoing, the internal auditors randomly select employees and personally hand them their paychecks rather than use the company mails. This procedure ensures that the names on the payroll represent real employees and not fictitious entries made by an unscrupulous supervisor who wants to receive some extra paychecks. What is this action by the internal auditors?
    a. financial audit
    b. random audit
    c. concurrent audit
    d. personal audit

44. Scenario: Jose Reyes recently graduated from a major university with a degree in computer science. He is now working as a software engineer for a software company that is developing a software system for the military. The system being developed will be used to aid in landing fighter aircraft on navy aircraft carriers. During one test, Jose discovers a rare bug in the system that causes inaccurate results to be reported to the fighter pilots, which could result in a crash landing. After thousands of hours of testing, Jose is unable to find the source of the error or reproduce the bug. The software is scheduled to be released soon, but first needs Jose's approval. What do you think is Jose's appropriate action in this situation?
    a. Continue with the scheduled release anyway the bug does not occur always.
    b. Do not give the approval unless the bug has been corrected and the system thoroughly tested.
    c. Inform the client of the problem and asks their decision on what to do.
    d. Let somebody test the system, if the error does not occur, proceed with the release.

45. You are a software engineer working for a large software development firm. You would like to be more independent and earn more, so you decide to practice your entrepreneurial spirit by taking on very small design contracts on your own, working evenings and weekends to meet the contracts. You do not inform your supervisor of your activity because your firm would not consider bidding on these small contracts as they would be more troublesome than they are worth. Why is this situation a conflict of interest?
    a. Your judgment as to what is "small" is biased by your determination of what is or is not of interest to your company.
    b. You earn more than your supervisor.
    c. Your officemates are not involved in the development of these projects.
    d. You have more interest and enthusiasm in developing your projects than the company's projects.

46. Sandra Torres works as a software developer in a large software development company. She is part of a team currently undergoing a development for a new software release which is a new concept in the market. Luisa is Sandra's best friend who is employed in another software development company and asks Sandra about the details of their new project. If you are Sandra, what is your reaction?
    a. Tell her everything about the project because she is my best friend.
    b. Tell her everything about the project but force her to tell also about their company's new projects.
    c. Do not talk to her because she is spying with my company.
    d. Explain to her that I cannot tell her about it because it will destroy my loyalty to my company and assure her that our friendship will remain the same.

II. SYSTEMS

BASIC COMPUTER ORGANIZATION AND ARCHITECTURE

EASY

47. Which of the following is the method of the ordinary computer basic architecture that loads programs and data together in a computer storage device and sequentially reads and executes them?
    a. address method
    b. virtual storage method
    c. hardware control method
    d. program storage method

48. Which of the following printers uses a heating element to melt the ink of the ink ribbon and is capable of printing on normal paper? (Remove and replace with another question about printer)
    a. ink-jet printer
    b. dot impact printer
    c. laser printer
    d. thermal transfer printer

49. Which of the following corresponds to the cause of the computer hardware internal interrupt?
    a. Occurrence of anomalies in the computer power-supply unit.
    b. The counter that measures clock time inside the processor has exceeded the preset value.
    c. Input/output device operation completion or failure occurrence.
    d. Occurrence of overflow in floating point operations.

50. Which of the following is the term that represents the time elapsed between when a series of works is requested to the computer and the processing results are received, in the batch processing mode?
    a. overhead
    b. turn-around
    c. throughput
    d. response

AVERAGE

51. Which of these values is the result of the subtraction of the hexadecimal numbers DD and 1F or “DD-1F”?
    a. AF
    b. BE
    c. CE
    d. EC

DIFFICULT

52. In a processor whose basic operating time (clock time) is 0.05 microseconds, when the values of the clock number required to execute an instruction and the instruction frequency

rate are the ones shown in the table, approximately what is the millions instruction per second (MIPS) average value of the processor performance?

Instruction type	Clock number required for instruction execution	Use frequency
Operation between registers	4	40%
Operation between memory and registers	8	50%
Unconditional branch	10	10%

a. 3
b. 9
c. 10
d. 30

53. Given the magnetic disk unit with the following performance, what is the average access time in milliseconds required to read the 2,000-byte-length-block data recorded in this magnetic disk?

Magnetic disk unit performance

Storage capacity per track (bytes)	20,000
Revolution speed (revolution/minute)	3,000
Average seek time (milliseconds)	20

a. 20
b. 32
c. 40
d. 42

PROGRAMMING LANGUAGES

EASY

54. Which of the following is NOT a component of a context-free grammar?
a. nonterminals
b. parse trees
c. productions
d. terminals

55. What is parsing?
a. Checking if the meaning of a sequence of tokens make sense.
b. Validating the correctness of a grammar
c. Determining whether a sequence of tokens can be generated by a given grammar.
d. Checking for semantic errors in a sequence of tokens.

56. What program translates a program written in one language (the source language) to an equivalent program written in another language (the target language)?
a. interpreter
b. compiler
c. linker

d. debugger

57. What is the phase of a compiler where a sequence tokens are parsed or derived based on a grammar?
    a. lexical analysis
    b. syntax analysis
    c. intermediate code generation
    d. semantic analysis

58. What do you call the sequence of characters that comprise a single token?
    a. terminal
    b. lexeme
    c. nonterminal
    d. node

59. What is the phase of compilation responsible for type checking and coercion?
    a. lexical analysis
    b. syntax analysis
    c. semantic analysis
    d. intermediate code generation

60. What is the name of the first compiler developed by a team led by John Backus?
    a. Algol
    b. C
    c. Pascal
    d. Fortran

AVERAGE

61. Given $\sum$={a,b}, which of the regular expressions below generates the language of all strings that are odd in length?
    a. (a + b) *
    b. (a + b) (a + b)*
    c. (ab + ba)* (a + b)
    d. (ab + aa + ba + bb)* (a + b)

62. Given $\sum$={a,b}, what language is described in the set of productions defined below?

    S → a X
    X → aX | bX | b

    a. All strings that starts with a and ends with b excluding the *empty* string.
    b. All strings that begins with a and ends with b including the *empty* string.
    c. All strings that begins with b and ends with b.
    d. All strings that begins with b and ends with a.

OPERATING SYSTEM

EASY

63. Which of the following is a correct description of memory interleaving?
    a. When new data is stored in cache memory, writing data in the cache that is no longer needed back to main memory.
    b. Compensating for the gap in access time between main memory and a magnetic disk.
    c. Updating main memory and cache memory simultaneously.
    d. Dividing main memory into several partitions that can be accessed in parallel in order to perform consecutive memory accesses efficiently.

64. There is one virtual memory system that divides the virtual address space into areas of a fixed length. Which of the following terms is the word for this fixed-length area?
    a. Sector
    b. Segment
    c. Frame
    d. Page

65. What is the purpose of task management in an OS?
    a. Providing a command-based interactive interface for the operator.
    b. Efficient implementation of virtual storage.
    c. Performing control functions in order to use the processor more efficiently.
    d. To permit the processing of data without needing to be aware of the hardware.

66. Which of the following is applicable to “multiprogramming”?
    a. Although multiple jobs are processed, they are executed as single tasks.
    b. Other tasks are executed in parallel with a given task by utilizing the CPU time that arises when performing I/O, etc.
    c. It is a programming method in which a program calls itself while it is running.
    d. It entails processing of programs in parallel and requires a parallel processing system that couples multiple processors and memory.

67. Page-swapping algorithms used in virtual storage systems include FIFO and LRU. Which of the following is appropriate as the basic concept behind these page-swapping algorithms?
    a. They predict which page will be referenced with the highest frequency after the given point in time.
    b. They predict which page will be referenced with the lowest frequency after the given point in time.
    c. They predict which page will be referenced the soonest in the future after the given point in time.
    d. They predict which page will not be referenced for the longest time into the future after the given point in time.

68. Which of the file organization method below does NOT ALLOW direct access?
    a. VSAM
    b. Indexed organization
    c. Sequential organization
    d. Direct organization

69. Which of the following is applicable to “dynamic link library(DLL)”?
    a. It is compiled by the compiler
    b. It is created by the pre-compiler before compiling.
    c. It is linked by the OS before execution.
    d. It is linked and compiled by the linker when the load module is created.

70. In which system does one computer function normally while the other is in the wait status?
    a. Dual system
    b. Duplex system
    c. Multi-processing system
    d. Load share system

71. Which of the following descriptions concerning task scheduling by an operating system is correct?
    a. The multiple queuing method first allocates low priority and long CPU times to the task for which allocation is requested, and then increases priority and gradually reduces the CPU time for it.
    b. The first-come first-served (FCFS) method allocates to tasks, CPU time with priorities in the order that the tasks are created. This aims at giving higher priorities to the tasks which started ahead of others and having them finish early.
    c. The shortest expected processing time first (SEPT) method improves the overall efficiency of system processing by increasing priorities of the tasks which have been using little CPU time, and by decreasing priorities of the tasks which have been using much CPU time.
    d. The round robin method allocates CPU time to the tasks in the requested order, and places at the end of the queue the task which has consumed the CPU time allocated to it.

72. Which of the following is the most appropriate description of preemption in the case of a real-time operating system?
    a. A task being executed is suspended at a specified interval and another ready task is executed.
    b. When a task being executed terminates or enters wait status, another ready task is executed.
    c. If a task with a higher priority than the one being currently executed becomes ready, the latter is suspended and the higher priority task is executed.
    d. If a high priority task is waiting for a low priority task to be terminated, the priority level of the low priority task is temporarily increased so that it may be executed.

73. "Memory leak" is a cause of system failure. Which of the following is the appropriate description of a "memory leak"?
    a. Part of a program residing in memory is paged out arbitrarily.
    b. A process writes its results outside the memory region which is secured for itself, and destroys the regions of other processes.
    c. As many processes repeatedly start and stop, many unused memory regions are created here and there, causing a reduction in the efficiency of memory utilization.
    d. Memory space secured by processes is not released even after it is no longer needed, thus gradually reducing the memory space which can be used by the system.

85. A CPU scheduling algorithm where each process gets a small unit of CPU time
    a. Shortest Job First
    b. Round Robin
    c. First-Come First-Serve
    d. d. Shortest Remaining Time First

86. A CPU scheduling algorithm which preempts the current process if a new process arrives with less CPU burst time than the remaining time of the executing process
    a. Priority CPU scheduling
    b. Round Robin
    c. First-Come First-Serve
    d. Shortest Remaining Time First

87. Priority scheduling may result to starvation, which one of the following choices will solve for this one
    a. apply FCFS scheduling
    b. apply aging to each process
    c. apply banker's algorithm
    d. starvation does not exist in priority scheduling, do nothing

88. An event in which the system is using vast majority of its available CPU cycles to swap between processes rather than run processes.
    a. context switching
    b. swapping
    c. paging
    d. thrashing

89. A method that divides the storage space into specific sizes, manages them, and implements virtual storage.
    a. context switching
    b. paging
    c. swapping
    d. thrashing

90. A technique in OS that allows the execution of a job that may be completed in the memory even though the memory space needed by some programs is larger than the installed physical memory.
    a. virtual machine
    b. virtual memory
    c. compaction
    d. fragmentation

91. Which of the following is the most appropriate description of spooling?
    a. It provides a standard communication procedure regardless of the other devices and the communication network.
    b. The operation of peripheral devices is separated and performed in parallel to the processor operation.
    c. It enables processing on a logical record basis without having to worry about the physical record.
    d. It records the information related to the computer system operation process.

92. An event in which the repetition of allocating and releasing of memory spaces of several programs causes a large number of small unused portions of the memory.
    a. compaction
    b. fragmentation
    c. segmentation
    d. contention

93. What is use to specify the location of a file within a directory, assuming that the operating system is performing file management in hierarchical structure?
    a. file extension
    b. root directory
    c. wild card
    d. path

94. An operating system scheduler that selects from among the processes in the memory that are ready to execute, and allocates the CPU to one of them.
    a. job scheduler
    b. CPU scheduler
    c. Medium-term scheduler
    d. task scheduler

AVERAGE

95. A processor accesses the main memory in 60 nanoseconds and cache memory in 10 nanoseconds. If there is an 80% probability that data to be accessed exists in cache memory, what is the average memory access time in nanoseconds for that processor?
    a. 14
    b. 20
    c. 50
    d. 70

DIFFICULT

96. If the specifications for a dual-sided, double density floppy disk are as shown in the table, what is the data storage capacity of one floppy disk in kilobytes? In this problem, 1 kilobyte is 1,024 bytes.

Number of tracks (single-sided)	80 tracks
Number of sectors / track	26 sectors
Data length	256 bytes/sector

    a. 520
    b. 1, 040
    c. 1, 064
    d. 1, 080

III. APPLICATIONS

BASIC STATISTICS
AVERAGE

97. The median of the following data 2, 4, 2, 4, 6, 8, 4, 5, 7, 3, 11 is
    a. 5
    b. 5
    c. 4.5
    d. 5.5

98. The mean of the following data set 2, 4, 2, 4, 6, 8, 4, 5, 7, 3, 11 is
    a. 4.09
    b. 5.09
    c. 8
    d. 65

DIFFICULT

99. Carmel has a normal distribution with a mean of 75 and a standard deviation of 5. She wishes to know how approximately what percentage of values will fall between 65 and 85:
    a. 10%
    b. 95%
    c. 68%
    d. 75%

DATABASE AND INFORMATION MANAGEMENT

EASY

100. Which type of database schema describes what data is stored in the database and the relationships among the data?
    a. conceptual schema
    a. external schema
    b. internal schema
    c. none of the above

101. What are the two required keywords in a SELECT statement?
    a. SELECT and WHERE
    b. SELECT and GROUP BY
    c. SELECT and FROM
    d. All of the above

102. Which is NOT a property of a relation?
    a. Each tuple within a relation is distinct
    b. The order of attributes within a relation has no significance
    c. The name of a relation is unique
    b. Each cell of a relation must contain at least one value

103. Which of the following operators is NOT used with multiple row subqueries?
    a. =
    b. all
    c. any
    d. in

104. What is specified by the Data Definition Language?
   a. How queries are evaluated.
   b. How data are structured.
   c. Entity-Relationship diagrams
   d. How data are queried.

105. What is the meaning of entity integrity rule?
   a. Every foreign key value must refer to existing primary key value or be null.
   b. Every table must have a primary key.
   c. A candidate key is arbitrarily designated to be the primary key.
   d. A primary key value must never be null.

106. Which normal form is based on the concept of full functional dependency?
   a. first normal form
   b. second normal form
   c. third normal form
   d. boyce-codd normal form

107. Which is a true statement about the HAVING clause?
   a. It is used to restrict rows.
   b. It is used to restrict columns clause.
   c. It is used to restrict groups.
   d. It must contain all non-group values in the select.

AVERAGE

108. How would you display a listing of the sum of employee salaries for those employees not making a commission (comm), for each job type (job), including only those sums greater than 2500?

   a.
```
select job, sum(sal)
from emp
where sum(sal) > 2500 and comm is null;
```

   b.
```
select job, sum(sal)
from emp
group by job
having sum(sal) > 2500 and comm is not null;
```

   c.
```
select job, sum(sal)
from emp
where sum(sal) > 2500 and comm is null;
group by job
```

   d.
```
select job, sum(sal)
from emp
where comm is null
group by job
having sum(sal) > 2500;
```

109. In an application, you are searching for specific employee information in the EMPLOYEE table corresponding to an invoice number you have. The INVOICE table contains empID,

the primary key for EMPLOYEE. Which of the following operations is appropriate for obtaining data from EMPLOYEE using your invoice number 10465312(invoiceNum)?

a. select * from EMPLOYEE where empID = 10465312
b. select * from EMPLOYEE e. INVOICE i where i.invoiceNum = 10465312
c. select * from EMPLOYEE e, INVOICE i
   where e.empID = i.empID and invoiceNum = 10465312
d. select e.empID, i.invoiceNum from EMPLOYEE e, INVOICE i
   where e.invoiceNum = i.invoiceNum

BASIC NETWORKING

EASY

110. What is the class of IP address 4.5.6.7?
   a. Class A
   b. Class B
   c. Class C
   d. Class D

111. How many bits are there in an IP V.4 address?
   a. 128
   b. 16
   c. 32
   d. 64

112. What IP address class has the greatest number of hosts per given network?
   a. A
   b. B
   c. C
   d. D

AVERAGE

113. A subnet mask in class A has fourteen 1s. How many subnets does it define?
   a. 8
   b. 16
   c. 32
   d. 128

114. Given the IP address 180.25.21.172 and the subnet mask 255.255.192.0, what is the subnet address?
   a. 180.0.0.0
   b. 180.25.0.0
   c. 180.25.8.0
   d. 180.25.21.0

115. Given the IP address 18.250.31.14 and the subnet mask 255.240.0.0, what is the subnet address?
   a. 18.0.0.14
   b. 18.9.0.14
   c. 18.31.0.14
   d. 18.240.0.0

116. What is the equivalent binary notation of 114.34.2.8?
   a. 01110010.00100010.00000011.00010000
   b. 01110100.00100010.00000010.00001000
   c. 01110011.00100010.00000010.00001000
   d. 01110010.00100010.00000010.00001000

117. What is the range of host IP addresses of 123.56.77.32/29 block?
   a. 123.56.77.32 – 123.56.77.39
   b. 123.56.77.32 – 123.56.77.40
   c. 123.56.77.32 – 123.56.77.63
   d. 123.53.77.32 – 123.56.77.255

118. What is the subnet mask of a class A IP address when the required number of subnets is 250?
   a. 255.0.0.0
   b. 255.255.0.0
   c. 255.250.0.0
   d. 255.2554.255.0

119. What is the subnet mask of a class C IP address when the required number of subnets is 70?
   a. 255.255.255.0
   b. 255.255.255.64
   c. 255.255.255.252
   d. 255.255.255.254

BASIC SOFTWARE ENGINEERING

EASY

120. What is test case generation method used in the white box test?
   a. the cause-effect graph
   b. equivalence partitioning
   c. the experimental design
   d. condition coverage

121. Which of the following is NOT RELATED to service standards for online system operations?
   a. response times
   b. operation starting time
   c. debugging time
   d. failure recovery time

122. Which of the following software test method is used to check whether modifications made for software maintenance have affected other portions or not?
   a. operation tests
   b. system tests
   c. linkage tests
   d. regression tests

123. Software quality characteristics include reliability, usability, maintainability and portability. Then, which of the following explains reliability?
   a. It indicates how easily operations can be mastered.
   b. It indicates whether functions required for software can always be maintained normally under designated conditions.
   c. It indicates the degree of modification which becomes necessary when software is to be used in a different computer environment.
   d. It indicates the degree of ease in which modification requests from users or troubles can be handled.

AVERAGE

124. Each of the following sentences describes work for one of the system development processes. Which gives the correct order of the development processes?

   A. Present problems are investigated and analyzed, then the requirements for a targeted system are defined.
   B. Functions required for building a system are partitioned into programs to make process flow clearer.
   C. Detailed processing procedures are designed, coded, and corrected.
   D. Tests are conducted.
   E. The structured design of each program is made based on internal design documents.
   F. Based on requirements for a system, functions necessary for the system are defined.

   a. A-F-B-C-E-D
   b. A-F-E-B-C-D
   c. A-F-B-E-C-D
   d. A-F-E-C-B-D

TRENDS AND ISSUES

EASY

125. What is the theft of information from a wireless device through a Bluetooth connection?
   a. bluesnarfing
   b. bluetheft
   c. podslarfing
   d. bluerobbery

126. Experts recommend that administrators must develop and enforce effective endpoint security policies to protect against network intrusions targeting individual computers and unauthorized download of data from a computer to a small device with storage capacity, such as a Flash drive or an iPod or other MP3 player. What is this unauthorized downloading?
   a. bluesnarfing
   b. podslarfing
   c. piracy
   d. blueslarfing

127. What software can be redistributed to anyone else without any restriction on whom can be the receiving party, the source code must be made available (so that the receiving party will be able to improve or modify it), and the license can require improved versions of the software to carry a different name or version from the original software?

a. shareware
b. open source
c. licensed
d. copyrighted

128. What is a personal journal that is frequently updated and intended for general public consumption uploaded in the Internet? The essential characteristics of this are its journal form, typically a new entry each day, and its informal style.

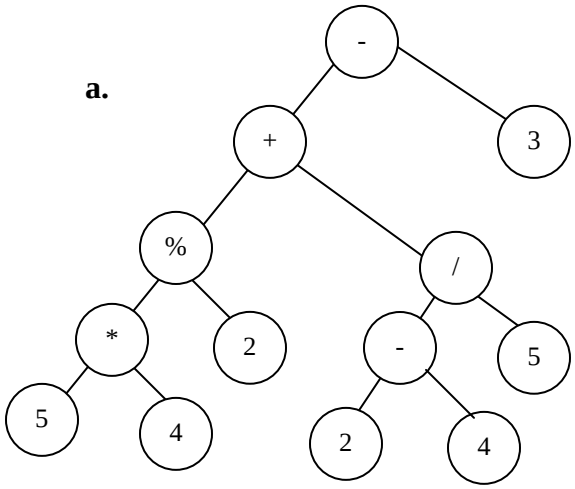
a. forum
b. blog
c. newsgroup
d. diary

PROGRAMMING LANGUAGES

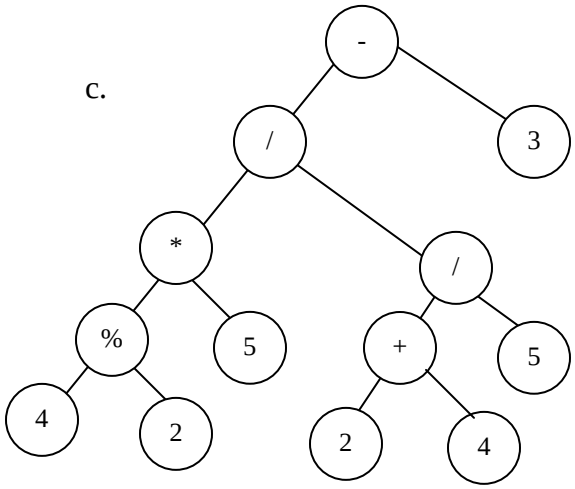
AVERAGE

129. The correct abstract syntax tree for the arithmetic expression (5*4%2+(2-4)/5)-3 is

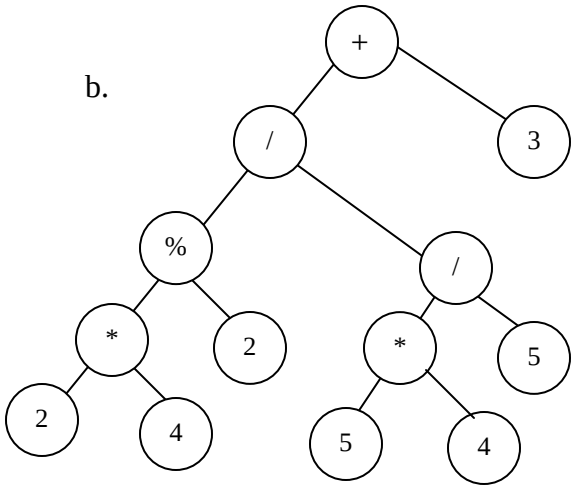
a.



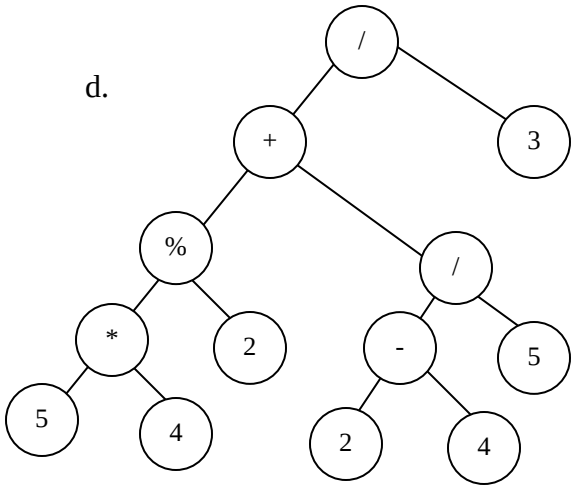
c.



b.



d.



130. The prefix notation of the expression A * (B + C) * D is
   a. *+A*BC+D
   b. ABC*+*
   c. *+*ABCD
   d. **A+B+CD

131. Rewrite the expression (A + B) * C + (D – E) in postfix notation.
   a. AB+C*DE-+
   b. ABCDE+*+-
   c. AB+*+DE-
   d. A+DCDE*+-

DIFFICULT

132. Identify which string is valid for a given grammar:

<expr> -> <term> { + <term>}
<term> -> <factor> { * <factor>}
<factor> -> ‘(‘ <expr> ‘)’ | <number>
<number> -> <digit> {<digit>}
<digit> -> ‘0’|’1’|’2’|…… |’9’

   a. 3 * (4+5) * (6+7)
   b. (2 + (3+(4 - 5)))
   c. 3 * (4+5) * (6+7))
   d. (3 + (4 +) * 3

133. A simple representation of a grammar that accepts decimal numbers such as 123.546, 0.23 and 56.0. It does not allow an empty integer part or empty decimal part is
   a. expr -><digit>{<digit>}.<digit>{<digit>}
      <digit>->’0’|’1’|’2’|’3’|…|’9’|
   b. expr -><digit><digit>.<digit>{<digit>}
      <digit>->’0’|’1’|’2’|’3’|…|’9’|
   c. expr ->{<digit>}.<digit>{<digit>}
      <digit>->’0’|’1’|’2’|’3’|…|’9’|
   d. expr -><digit>{<digit>}.<digit><digit>

<digit>->’0’|’1’|’2’|’3’|…|’9’|

134. Identify which string is valid for a given grammar:

<expr> -> <term> { + <term>}
<term> -> <factor> { * <factor>}
<factor> -> ‘(‘ <expr> ‘)’ | <number>
<number> -> <digit> {<digit>}
<digit> -> ‘0’|’1’|’2’|…… |’9’

a. 3 * (4+5) * (6+7)
b. (2 + (3+(4 + 5))))
c. (10 - (3+(4 + 5)
d. (2 + (3/*(4 + 5)))