ADAMA SCIENCE AND TECHNOLOGY UNIVERSITY

SCHOOL OF ELECTRICAL ENGINEERING AND COMPUTING

COMPUTER SCIENCE AND ENGINEERING

2015 Model Exit Examination of Computer Science and Engineering

Date: March 15, 2023

Time Allocated: 2hrs.

Total Question: 100

Information:

- In this model exam, there are 6 themes, 13 courses and 100 multiple choice questions.
- Choose the Appropriate Answers for each Questions

Choose the best answer

1. In which steps of problem solving life cycle what input data are needed to solve problem, what procedure is needed to achieve the result and what output are expected are identified
   A. Analysis (problem specification)
   B. Algorithm design.
   C. Implementation or coding
   D. Maintenance and documentation

2. What is the value of p in the following C++ code snippet?

```
#include <iostream>
using namespace std;
int main(){
  int p;
  bool a = true;
  bool b = false;
  int x = 10;
  int y = 5;
  p = ((x | y) + (a + b));
  cout << p;
  return 0;
}
```

   A. 12   B. 14   C. 2   D. 16

3. Which of the following is correct about this pointer in C++?
   A. this pointer is passed as a hidden argument in all static variables of a class
   B. this pointer is passed as a hidden argument in all the functions of a class
   C. this pointer is passed as a hidden argument in all non-static functions of a class
   D. this pointer is passed as a hidden argument in all static functions of a class

4. What is the difference between a declaration and a definition of a variable?
   A. Both can occur multiple times, but a declaration must occur first.
   B. A definition occurs once, but a declaration may occur many times.
   C. A declaration occurs once, but a definition may occur many times.
   D. Both can occur multiple times, but a definition must occur first.

5. Which development phase of problem solving life cycle Method is used to verify correctness and that requirements are met or not.

   A. Testing   B. Debugging   C. Analysis   D. Maintenance

6. Identify the correct order for the program execution

   A. Object code, Source code, Executable code.

   B. Source code, Object code, Executable code.

   C. Running, Debugging, Compiling,

   D. Running, Compiling, Debugging.

7. Which of the following is the correct order of program execution in "for loop" based on the syntax below.

   For (initialization; condition; increment/Decrement) {

   //body of the loop

   }

i.	Condition is checked	iii. Increment/Decrement
ii.	Initialization is executed	iv. statement is executed

   A. ii, i, iv and iii   C. ii, iv,iii and i

   B. ii,i,iv and iii   D. ii,iv,iii and i

8. Which one of the following is the feature of java that **"Write once, run anywhere"?**

   A. Platform independent
   B. Simple
   C. Robust
   D. Distributed

9. Java String object cannot be changed after creation as it is marked _____

   A.) final
   B.) Constant
   C.) transient
   D.) volatile

10. What will be the output of the following Java program?
    class A
    {
    public int i;
    public int j;
    A()
    {
    i = 1;
    j = 2;

```
}}
class B extends A
{
int a;
B()
{
super();
}}
class super_use
{
public static void main(String args[])
{
B obj = new B();
System.out.println(obj.i + " " + obj.j)
}}
```
  A. 1 2
  B. 2 1
  C. Runtime Error
  D. Compilation Error

11. What is the output of the below Java program on the references of Superclass and Subclass?
```
class Food
{
void show()
{
System.out.print("FOOD ");
}}
class Bread extends Food
{
void toast()
{
System.out.print("TOASTED ");
}}
public class Inheritance5
{
public static void main(String[] args)
{
Food foo = new Food();
foo.show();
Food foo2 = new Bread();
foo2.show();
Bread br = new Bread();
br.toast();
br.show();  }}
```
  A. FOOD FOOD FOOD FOOD
  B.   FOOD FOOD TOASTED FOOD

C. FOOD TOASTED FOOD FOOD

D. Compiler error

12. All classes in Java are inherited from which class?

A. java.lang.class

B. java.class.inherited

C. java.class.object

D. java.lang.Object

13. What is the value of A[1] after execution of the following program.

```
int[] A = {0,2,4,1,3};
for(int i = 0; i < a.length; i++){
   a[i] = a[(a[i] + 3) % a.length];
}
```

A. 1

B. 2

C. 0

D. 3

14. What is the output of the following code

```
class Test extends Exception { }

class Main {
  public static void main(String args[]) {
    try {
      throw new Test();
    }
    catch(Test t) {
      System.out.println("Got the Test Exception");
    }
    finally {
      System.out.println("Inside finally block ");
    }
  }
}
```

A. Got the Test Exception Inside finally block

B. Got the Test Exception

C. Compiler Error

D. Inside finally block

15. Algorithm Analysis is a theoretical study of computer-program performance and resource usage. Which of the following is/are the main reason why we study algorithm's performance.

    A. Correctness

    B. Maintainability

    C. Functionality

    D. Scalability

16. What is the output if we put the following functions by increasing order of growth/complexity : $nlogn,\ n^{logn},\ (logn)^n,\ 2^{logn/2},\ n^2$

    A. $(\log n)^n$, $n^{\log n}$, $2^{\log n/2}$, $n \log n$, n^2
    B. $n \log n$, n^2, $n^{\log n}$, $2^{\log n/2}$, $(\log n)^n$
    C. n^2, $2^{\log n/2}$, $n^{\log n}$, $(\log n)^n$, $n \log n$
    D. $nlogn,\ n^{logn},\ (logn)^n,\ 2^{logn/2},\ n^2$

17. The worst-case running time of **binary search** is_____.

    A. $O(n)$

    B. $O(\log n)$

    C. $O(n \log n)$

    D. $O(n^2)$

18. The solution for the recurrence $T(n)= 8T(n/2) + n^3$ is

    A. $\Theta(n^3)$
    B. $\Theta(n^3 \log n)$
    C. $\Theta(n^{2.81})$
    D. $\Theta(n!)$

19. The ***Tower of Hanoi*** puzzle. In this puzzle, mythical monks, have *n* disks of different sizes that can slide onto any of three pegs. Initially, all the disks are on the first peg in order of size, the largest on the bottom and the smallest on top. The goal is to move all the disks to the third peg, using the second one as an auxiliary, if necessary. They can move only one disk at a time, and it is forbidden to place a larger disk on top of a smaller one. What is the recurrence of Towers of Hanoi?

A. T(n)=2T(n)+1

B. T(n)=2T(n)-1

C. T(n)=2T(n-1)+1

D. T(n)=2T(n+1)-1

20. If a problem satisfies the optimal-substructure property and a locally optimal solution is globally optimal. Which designing technique is the most appropriate choice?

A. Greedy

B. Dynamic programming

C. Backtracking

D. Divide and conquer

21. Which of the following designing technique is appropriate for quick sort?

A. Greedy

B. Dynamic programming

C. Backtracking

D. Divide and conquer

22. Suppose that an algorithm has time complexity $T(n) = n^2$, and that executing an implementation of it on a particular machine takes t seconds for n inputs. Now suppose that we are presented with another machine that is 100 times as fast. How many inputs could we process on the new machine in t seconds?

A. n^2

B. 10 n

C. n^{100}

D. 100n

23. A program P reads in 500 integers in the range [0..100] representing the scores of 500 students. It then prints the frequency of each score above 50. What would be the best way for P to store the frequencies?

A. An array of 50 numbers

B. An array of 100 numbers

C. An array of 500 numbers

D. A dynamically allocated array of 550 numbers

24. Which of the following statements about linked list data structure is/are TRUE?

   A. Addition and deletion of an item to/ from the linked list require modification of the existing pointers
   B. The linked list pointers do not provide an efficient way to search an item in the linked list
   C. Linked list pointers always maintain the list in ascending order
   D. The linked list data structure provides an efficient way to find kth element in the list
25. consider the function f defined here:

struct item

{

int data;

struct item * next;

};

int f (struct item *p)

{

return((p==NULL) ||((p->next==NULL)||(p->data<=p->next->data) && (p->next)));

}

For a given linked list p, the function f returns 1 if and only if

A. the list is empty or has exactly one element

B. the element in the list are sorted in non-decreasing order of data value

C. the element in the list are sorted in non-increasing order of data value

D. not all element in the list have the same data value

26.   Given the following Linked list
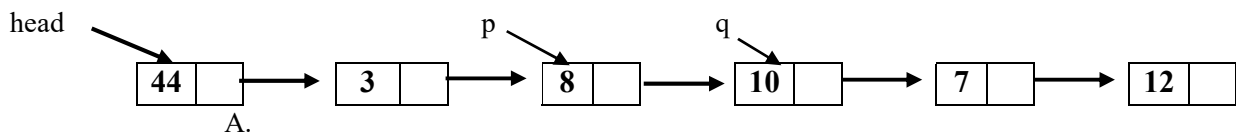
What will be the output if we execute the following code

```
head->next->next->data = p->next->data;
p->next=p->next->next->next;
delete q->next;
delete q;
```
A. 44 3 10 7   12
B. 44 3 8   10 7
C. 44 3   10 12
D. 44 3 12   10 7

27. Consider the following stack of characters, where STACK is allocated N = 7 memory cells

STACK : A,C,D,F,_,_,_. (_ means empty allocated cell). What will the stack be the following operations takes place:

(a) POP(STACK, ITEM)
(b) POP(STACK, ITEM)
(c) POP(STACK, ITEM)
(d) PUSH(STACK, S)
(e) PUSH(STACK,T)
(f) PUSH(STACK, U)
(g) PUSH(STACK,C)
(h) PUSH(STACK,S)
(i) PUSH(STACK,E)
(j) TOP(STACK, ITEM)

A. A C D F S T U
B. A S T U C S
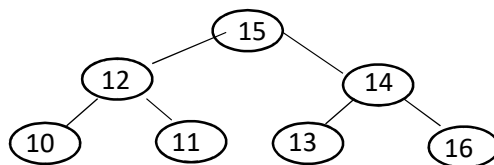C. A C S T U S
D. A S T U C S E

28. For a given a pre-order =[13,11,10,12,14,15,16] and In-order=[10,11,12,13,14,15,16].

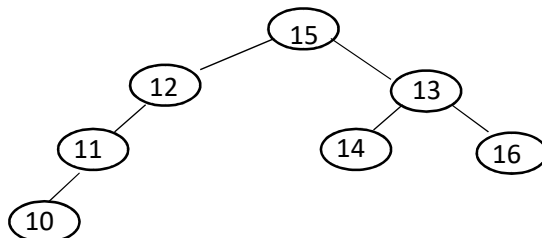Which of the following can be an equivalent binary tree?
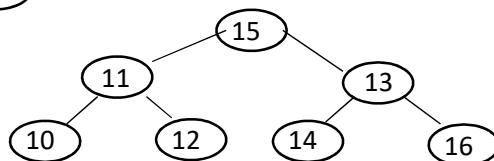
A.
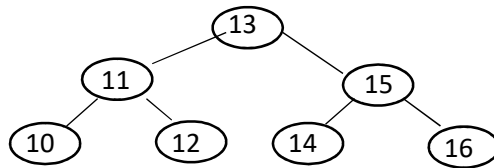
B.

C.

D.

29. The process of maintaining a record of project development and maintenance.

    A. Process documentation
    B. Product documentation
    C. User documentation
    D. System documentation

30. In a good system design, the relationship between components should be high within the sub-system. Which one of the following expressed the concept very well?

    A. High coupling
    B. Low cohesion
    C. High cohesion
    D. Interaction

31. In which elicitation process the developers discuss with the client and end users and know their expectations from the software?

    A. Requirement Gathering
    B. Organizing requirements
    C. Negations and discussion
    D. Documentation

32. What type of software testing is generally used in Software Maintenance?

    A. Regression Testing
    B. System Testing
    C. Integration Testing
    D. Unit testing

33. Which of the following is a key principle of software engineering?

    A. Reusability
    B. Reliability
    C. Efficiency
    D. Maintainability

34. What is the most important feature of spiral model?

    A. Performance management
    B. Efficiency management
    C. Risk management
    D. Quality management

35. From the following software process models, which process model is chosen if the development team has less experience on similar projects?

    A. Spiral

B. RAD

C. Waterfall

D. Agile

36. What are some of the important points we have to consider to convert *ER Diagram* into *Relational Table*?

    A. Single-valued attributes are not included in the relational table.

    B. The tables are mapped to the entity types.

    C. The Relational Tables rows are indicated in the ER Diagram as attributes.

    D. Instances will be properties of the table

37. Which one of the following cannot be reduced by using *Normalization techniques* in the database design process?

    A. Insert anomalies

    B. Update anomalies

    C. Delete anomalies

    D. Instances of tables

38. A relational table that is in 2NF need to be in 1NF and all the attribute types should be dependent on the _____ key.

    A. Foreign key

    B. Primary key

    C. Composite key

    D. Alternate key

39. One of the following operations is very important to read data from a database and *store it in a buffer* in the main memory.

    A. Rollback

    B. Committee

    C. Write

    D. Read

40. Which of the following statements are true about deadlock?

    A. Once two transactions deadlock, one of them must be aborted to maintain correctness.

    B. Systems that support update locks (S, X and U modes) cannot deadlock.

    C. If all transactions use two-phase locking, they cannot deadlock.

    D. Validation based concurrency control schemes cannot deadlock.

41. What is the advantage of optimistic locking?

    A. The lock is obtained before the transaction has processed.

    B. The lock is obtained only after the transaction has processed.

    C. The lock never needs to be obtained.

    D. Transactions that are best suited are those with a lot of activity.

42. The result which operation contains all pairs of tuples from the two relations, regardless of whether their attribute values match.

    A. Cartesian product

    B. Set difference

    C. Left join

    D. Right join

43. With regards to transaction processing, any DBMS should be capable of:

    A. Ensuring that transactions are free from interference from other users.

    B. Parts of a transaction are not lost due to a failure.

    C. Transactions do not make the database inconsistent.

    D. Transactions updates become unstable and are stored in volatile memory.

44. A method that allows to start a new transaction(or obtain the currently active transaction)

    A. getTransaction()

    B. commit()

    C. rollback()

    D. abort()

45. A lock that allows concurrent transactions to access different rows of the same table is known as a

    A. Field-level lock

    B. Row-level lock

    C. Table-level lock

    D. Database-level lock

46. Which of the following is not a project management goal?

    A. Keeping overall costs within budget
    B. Delivering the software to the customer at the agreed time
    C. Maintaining a happy and well-functioning development team
    D. Avoiding customer complaints

47. Which of the following is not considered a risk in project management?

    A. Specification delays
    B. Product competition
    C. Testing
    D. Staff turnover

48. Assume you have taken over a project that is currently in trouble. You have held a meeting with the stakeholders to demonstrate the new product prototype. They came prepared with the product requirements and upon inspection inform you that this prototype is not what the customer specified. Your boss instructs you to get the prototype corrected and make it match the requirements the customer specified before holding a demo with the customer. The boss also warns you to take a look at the work of the project. He is concerned that things are not happening as planned and that the last project manager was not paying close enough attention to the project plan. Corrections might be needed. What Knowledge Area does this describe?

    A. Project Schedule Management
    B. Project Scope Management
    C. Project Integration Management
    D. Project Risk Management

49. A process that involves continuously improving and detailing a plan as more detail become available is termed as

    A. project analysis
    B. project enhancing
    C. progressive deliberation
    D. progressive elaboration

50. The strategy used to correct resource over-allocations by balancing the demand for resources and the available supply is known as

    A. resource assignment
    B. resource leveling
    C. resource splitting
    D. resource scheduling

51. According to Olivier Mesly, the 4 P's critical for the success of a project are:

    A. plan, processes, people, policy
    B. plan, processes, people, power
    C. plan, processes, potential, policy
    D. plan, processes, potential, power

52. A project manager is in the process of building the project team and obtaining the materials and supplies the team will need to achieve the project's planned outcomes. In what activity are they engaged?

   A. Developing resources
   B. Managing resources
   C. Acquiring resources
   D. Estimating resource needs
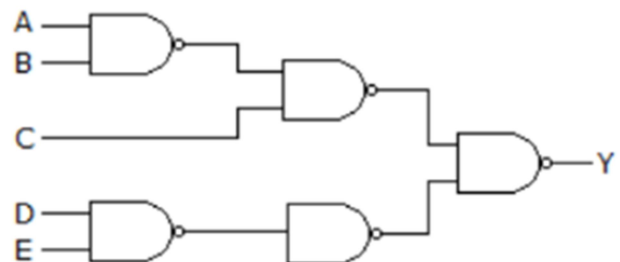
53. Convert the decimal number 430 to Excess-3 code:

   A. 110110001
   B. 110110000
   C. 110110011
   D. 110100001

54. If a signal passing through a gate is inhibited by sending a LOW into one of the inputs, and the output is HIGH, the gate is a(n):
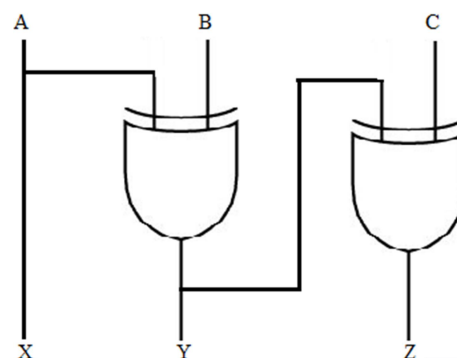
   A. AND
   B. NAND
   C. NOR
   D. OR

55. The circuit of the given figure realizes the function

   A. (A'+B')C+ (DE)'
   B. A'+B'+C'+D'+E'
   C. AB+C+DE
   D. AB+C(D+E)

56. The logic circuit given figure below converts a binary code ABC into

   A. Excess-3 Code
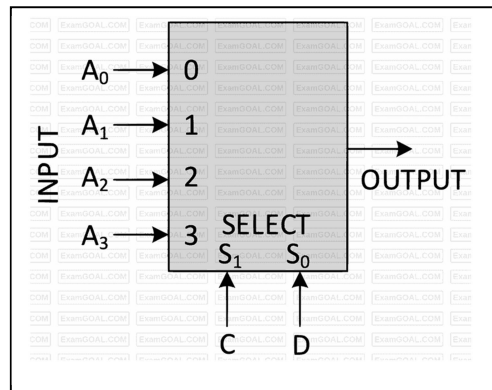   B. Gray Code
   C. BCD code
   D. Hamming Code

57. For the K map in the given figure the simplified Boolean expression is

CD AB	00	01	11	10
00				
01		1		
11		1	1	
10			1	

A. ACD + BCD

B. AC'D + BCD

C. ACD + BC'D

D. AC'D + BC'D

58. Consider the 2-bit multiplexer (MUX) shown in the figure. For OUTPUT to be the XOR of
C and D, the values for A_0, A_1, A_2 and A_3 are _____.

A. $A_0 = 0$, $A_1 = 0$, $A_2 = 1$, $A_3 = 1$

B. $A_0 = 1$, $A_1 = 0$, $A_2 = 1$, $A_3 = 0$

C. $A_0 = 0$, $A_1 = 1$, $A_2 = 1$, $A_3 = 0$

D. $A_0 = 1$, $A_1 = 1$, $A_2 = 0$, $A_3 = 0$

59. A J-K flip-flop with J = 1 and K = 1 has a 20 kHz clock input. The Q output is _____

    A. Constantly LOW

    B. Constantly HIGH

    C. A 20 kHz square wave

    D. A 10 kHz square wave

60. "Is there a multiply instruction?" is the question of

    A. Computer Architecture
    B. Computer Organization
    C. Computer Architecture and Computer Organization
    D. Neither Computer Architecture nor Computer Organization

61. Which one of the following is not a techniques to speed up a processor

    A. Using cache memory
    B. Using instruction level parallelism: applying pipelining
    C. Using hardware level parallelism: using multi-core processors
    D. Dispersing components within a processor

62. Which one of the following instruction addressing formats is written in two addressing

   format

    A. ADD [100],[004],[250]
    B. ADD [100],[004]
    C. ADD [100]
    D. ADD

63. Which one of the following instruction addressing modes is written in Register Indirect

   Mode

    A. ADD R1,R2,[R3]
    B. ADD R1,(R2)
    C. ADD
    D. ADD R1,[R2]

64. Why do we use different hierarchies of memory types?

    A. For aesthetic purpose
    B. Because it is how computers should be designed like
    C. Because we cannot have a technology with high performance, affordable cost, and large
       capacity
    D. Because manufacturers want us buy their product with relatively high price

65. If the length of the address bus of a processor is 5 lines, what is the maximum number of

   addressable segments a main memory could have?

A. 32

B. 16

C. 64

D. 25

66. Sending a request signal that asks processor to suspend its current execution and serve the current request is referred to as:

A. Pipelining

B. Suspending

C. Interrupting

D. Galvanizing

67. Two processes, p1 and p2, need to access a critical section of code. Consider the following synchronization construct used by the processes:

```
/*   p1  */
while(true){
    wants1=true;
    while(wants2= =true);
   /*critical section*/
 wants1=false;
}
/* remainder section*/
```

```
/*   p2  */
while(true){
    wants2=true;
    while(wants1= = true);
   /*critical section*/
 wants2=false;
}
/* remainder section*/
```

Here, wants1 and wants2 are shared variables, which are initialized to false.

Which one of the following statements is TRUE about the above construct?

A. It does not ensure mutual exclusion.

B. It does not ensure bounded waiting.

C. It requires that processes enter the critical section in strict alternation.

D. It does not prevent deadlocks, but ensures mutual exclusion.

68. Consider the methods used by processes P1 and P_2 for accessing their critical sections whenever needed, as given below. The initial values of shared Boolean variables S1 and S2 are randomly assigned.

Method used by P_1	Method used by P_2
While(S_1==S_2); Critical Section S_1=S_2;	While(S_1!=S_2); Critical Section S_2=not(S_2);

Which one of the following statements describes the properties achieved?

A. Mutual exclusion but not progress

B. Progress but not mutual exclusion

C. Neither mutual exclusion nor progress

D. Both mutual exclusion and progress

69. Which of the following statements are true?

I.   Shortest remaining time first scheduling may cause starvation.

II.   Pre-emptive scheduling may cause starvation.

III. Round robin is better than FCFS in terms of response time.

A. I only

B. I and III only

C. II and III only

D. I, II and III

70. Consider the following code:

signal (mutex);

....

Critical section

....

wait (mutex);

Here 'mutex' is a semaphore variable, which is initialized to 1. Then

A. Mutual exclusion is provided

B. Mutual exclusion violated, if several processes are simultaneously active in their critical section.

C. Deadlock will occur

D. Starvation is possible

71. Three concurrent processes X, Y, and Z execute three different code segments that access and update certain shared variables. Process X executes the P operation (i.e., wait) on semaphores a, b and c; process Y executes the P operation on semaphores b, c and d, process Z executes the P operation on semaphores c, d, and a before entering the respective code segments. After completing the execution of its code segment, each process invokes the V operation (i.e., signal) on its three semaphores. All semaphores are binary semaphores initialized to one. Which one of the following represents a deadlock-free order of invoking the P operations by the processes?

A. X: P(b)P(a)P(c) Y: P(b)P(c)P(d) Z: P(a)P(c)P(d)

B. X: P(a)P(b)P(c) Y: P(b)P(c)P(d) Z: P(c)P(d)P(a)

C. X: P(b)P(a)P(c) Y: P(c)P(b)P(d) Z: P(a)P(c)P(d)

D. X: P(a)P(b)P(c) Y: P(c)P(b)P(d) Z: P(c)P(d)P(a)

72. A scheduling algorithm assigns priority proportional to the waiting time of a process. Every process starts with priority zero (the lowest priority). The scheduler re-evaluates the

process priorities every T time units and decides the next process to schedule. Which one of the following is TRUE if the processes have no I/O operations and all arrive at time zero?

    A. This algorithm is equivalent to the first-come-first-serve algorithm.
    B. This algorithm is equivalent to the round-robin algorithm.
    C. This algorithm is equivalent to the shortest-job-first algorithm
    D. This algorithm is equivalent to the shortest-remaining-time-first algorithm.

73. Consider the 3 processes, P1, P2 and P3 shown in the table.

Process	Arrival time	Time Units Required
P1	0	5
P2	1	7
P3	3	4

The completion order of the 3 processes under the policies FCFS and RR2 (round robin scheduling with CPU quantum of 2 time units) are :

    A. FCFS: P1, P2, P3 RR2: P1, P2, P3
    B. FCFS: P1, P3, P2 RR2: P1, P3, P2
    C. FCFS: P1, P2, P3 RR2: P1, P3, P2
    D. FCFS: P1, P3, P2 RR2: P1, P2, P3

74. Let the time taken to switch between user and a kernel modes of execution be t1 while the time taken to switch between two processes be t2. Which of the following: is TRUE?

    A. (t1) > (t2)
    B. (t1) = (t2)
    C. Nothing can be said about the relation between t1 and t2
    D. (t1) < (t2)

75. Which of the following is NOT true of deadlock prevention and deadlock avoidance schemes?

    A. In deadlock prevention, the request for resources is always granted if the resulting state is safe
    B. In deadlock avoidance, the request for resources is always granted if the result state is safe
    C. Deadlock avoidance is less restrictive than deadlock prevention
    D. Deadlock avoidance requires knowledge of resource requirements a priori

76. In which one of the following page replacement algorithms it is possible for the page fault rate to increase even when the number of allocated frames increases?

    A. LRU (Least Recently Used)
    B. OPT (Optimal Page Replacement)
    C. MRU (Most Recently Used)
    D. FIFO (First In First Out)

77. You are the Network Administrator for your company. A new branch office is opening and you are selecting the necessary hardware to support the network. There will be two groups

of computers, each organized by department. The Sales group computers will be assigned IP addresses ranging from 192.168.1.2 to 192.168.1.50. The Accounting group will be assigned IP addresses ranging from 10.0.0.2 to 10.0.0.50. What type of device should you select to connect the two groups of computers so that data communication can occur?

    A. Hub
    B. Switch
    C. Bridge
    D. Router

78. Bits can be sending over guided and unguided media as analog signal by_____.

    A. Digital modulation
    B. Frequency modulation
    C. Amplitude modulation
    D. Phase modulation

79. Which data communication method is used to transmit the data over a serial communication link?

    A. Simplex
    B. Full duplex
    C. Half-duplex
    D. All of the above

80. In communication satellite, multiple repeaters are known as?

    A. Detectors
    B. Stations
    C. Modulators
    D. Transponders

81. The loss of signal power as light travels down the fiber is called?

    A. Attenuation
    B. Scattering
   C. Noisy
    D. Distortion

82. A host is sending 100 datagrams to another host using IPv4. If the identification number of the first datagram is 50, what is the identification number of the last?

    A. 150
    B. 151
    C. 149
    D. 5000

83. TCP goes into fast retransmit mode when

    A. It does not receive acknowledgment for the packet
    B. It receivers ICMP error message
    C. It receives duplicate acknowledgments

D. Receives acknowledgment late

84. Which of the following is related with the data link layer of the OSI Reference model?

    A. Port addressing
    B. Routing
    C. Physical addressing
    D. Logical addressing

85. The process of a web server adding a TCP header to a web page, followed by adding an IP header, and then a data link header and trailer is an example of what?

    A. Data encapsulation
    B. Same-layer interaction
    C. Data fragmentation
    D. Reassembly

86. A data has a destination socket address of 70.16.32.41:23. What can you say about this data?

    A. It is going from a server to a client
    B. It is going from a client to a server
    C. A web server is the source of this data
    D. Nothing can be said

87. Which statement is correct about the relationship among formal languages, formal grammars, and automata?

    A. Formal language is a set of strings defined over an alphabet, which can be generated by formal grammar or recognized/accepted by an automata.

    B. A context free language is also a regular language which can be accepted by a finite automata.

    C. A formal language is regular, if and only if, it is recognized by pushdown automata.

    D. Given a formal language, there is only one unique formal grammar and/or automata for it.

88. Given a CFG G and a string $w \in L(G)$, when did we say that a given formal language or grammar or a string w is ambiguous?

    A. When there are two different derivation trees for the same string w.
    B. When the derivation tree for left-most derivation and right-most derivation are the same for the string w.
    C. When all strings in the language have a unique derivation tree.
    D. When there are more than one derivation for the same string w.

89. What is the language recognized or accepted by the **DFA** M below?
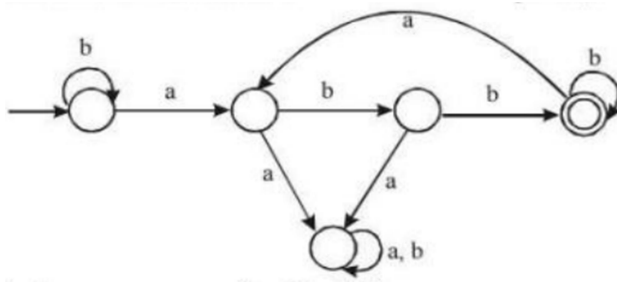
A. $L(M) = \{w \in \{a, b\}^* \mid$ every a in w is followed by exactly two b's.$\}$

B. $L(M) = \{w \in \{a, b\}^* \mid$ every a in w is followed by at least two b's.$\}$

C. $L(M) = \{w \in \{a, b\}^* \mid$ w contains the substring abb and ends with an a followed by at least two b's.$\}$

D. $L(M) = \{w \in \{a, b\}^* \mid$ w does not contain aa as a substring.$\}$

90. Given an arbitrary non-deterministic finite automaton (NFA) with N states, the maximum number of states in an equivalent minimized DFA is at least.

    A. N^2

    B. 2^N

    C. $2N$

    D. $N!$

91. Determine the equivalent regular expression for the finite automaton given below.
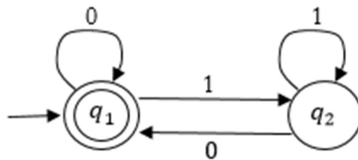
    A. 0* + 0*11*00*

    B. (0* + (0*11*00*)*)*

    C. 0* + (0*11*00*)*

    D. 0* + (0*1*11*00*)

92. What is the context-free language generated by the context-free grammar G with productions $S \rightarrow aSb \mid \varepsilon$?

    A. $L(G) = \{a^n b^n \mid n \geq 0\}$

    B. $L(G) = \{a^n b^n \mid n \geq 1\}$

    C. $L(G) = \{a^n b^n \mid n > 1\}$

    D. $L(G) = \{ab, aabb, aaabbb, \dots\}$

93. Which of the following statement is correct?

   A. If a regular expression r does not contain the symbol $*$ then the language $L(r)$ defined by r is infinite.

   B. There exists a regular language L such that $a^i b^i c^i \in L$ for any natural number i.

   C. If a pushdown automaton accepts by empty stack then it does not accept the empty string.

   D. If a finite automaton has n states and accepts a string of length n then it accepts an infinite language.

94. Which one of the following **does not** fall under the umbrella of the main goals of Artificial Intelligence?

   A. Solving problems through writing down the exact steps required.

   B. An intelligent connection of perception and action.

   C. Building a machine which can perform tasks that requires human intelligence such as proving a theorem.

   D. Creating some system which can exhibit intelligent behavior, learn new things by itself, demonstrate, explain, and can advise to its user.

95. Which of the following statement is not correct?

   A. Greedy graph search is guaranteed to return an optimal solution.

   B. A* graph search is guaranteed to return an optimal solution.

   C. A* graph search is guaranteed to expand no more nodes than uniform-cost graph search.

   D. The heuristic function calculates the cost of an optimal path between the pair of states.

96. Which of the following is not true about knowledge-based agents?

   A. It can maintain an internal state of knowledge and reason over that knowledge.

   B. It can update their knowledge after observations and take action.

   C. It can represent the world with some formal representation and act intelligently.

   D. The main drawback is it fails to combine general knowledge with current percepts to infer hidden aspects of the current state prior to selecting actions.

97. Choose the correct option according to the given statement.

   Statement 1: Intelligent agent operates autonomously, perceive their environment, persist over a prolonged time period, adapt to change, and create and pursue goals.

   Statement 2: Learning improves the performance of the intelligent agent to reach

good decisions, especially in circumstances that are new.

Statement 3: A rational agent is one that acts so as to achieve the best outcome or when there is uncertainty, the best expected outcome.

Statement 4: It is possible for a given agent to be perfectly rational in two distinct tasks environments.

Statement 5: The input to an agent program is the same as the input to the agent function.

A. Statement 1, 2, 3, 4 and 5 are correct.

B. Only statement 1, 2, and 3 are correct.

C. Statement 1, 2, 3 and 4 are correct.

D. Only statement 1 and 2 are correct.

98. Which of the following is a correct match based on the table below.

(D) Iterative deepening	i. A search that necessarily reduces to uniform-cost search when the heuristic h is admissible
(A) A* Search	ii. performs much worse than depth-first search for a domain in which every state has a single successor, and there is a single goal at depth n.
(P) Percept sequence	iii. depends on the distinction in desirability between different goals.
(O) optimality	iv. the complete history of everything the agent has ever perceived.
(S) Search algorithm	v. It is said as complete algorithm if it ends with a solution (if any exists).

A. A-i, D-ii, O-iv, P-iii, S-v

B. A-ii, D-i, O-iii, P-iv, S-v

C. A-i, D-ii, O-iii, P-iv, S-v

D. A-i, D-iv, O-iii, P-ii, S-v

99. Which of the following propositions is not equivalent to the others?

A. The sentence α entails the sentence β.

B. α is true in all models where β is true.

C. β follows logically from α.

D. $\alpha \models \beta$.

100.   Which of the following is not true of learning functions?

A. Deep learning works well for visual object recognition, speech recognition, natural language processing, and reinforcement learning in complex environments.
B. Recurrent networks are not effective for sequence-processing tasks including language modeling and machine translation.
C. Neural networks represent complex nonlinear functions with a network of parameterized linear-threshold units.
D. Reinforcement learning frees us from manual construction of behaviors and from labeling the vast data sets required for supervised learning, or having to hand-code control strategies