# MADRAS INSTITUTE OF TECHNOLOGY
# ANNA UNIVERSITY
# ASSOCIATION OF COMPUTER TECHNOLOGISTS

## HEXATHLON

### RULES:

- On the answer sheet team member should stick their team QR and write their unique participant id below it.
- Don't leave the app during the test.
- Time limit – 45 minutes.
- Keep your mobile in airplane mode.
- There will be SIX domains namely coding, DBMS, OS, networks, web programming and security .
- Choose any THREE domains of your choice.

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# CODING

1. For construction of a binary heap with property that parent node has value less than child node. In reference to that which line is incorrect.

```
1. add(int k)
2. {
3.          heap_size++;
4.          int i = heap_size - 1;
5.          harr[i] = k;
6.          while (i != 0 && harr[parent(i)] < harr[i])
7.          {
8.                  swap(&harr[i], &harr[parent(i)]);
9.                  i = parent(i);
10.         }
11. }
```

a) Line 3 b) Line 5 c) Line 6 d) Line

2. What will be the output of the following C++ code?

```
#include<iostream>
using namespace std;
int x = 1;
int main()
{
   int x = 2;
   {
      int x = 3;
      cout << ::x << endl;
   }
   return 0;
}
```

a) 1 b) 2 c) 3 d) 123

3. Given that 2 elements are present in the tree, write a function to find the LCA (Least Common Ancestor) of the 2 elements.

a)
```
public void lca(Tree root,int n1, int n2)
   {
      while (root != NULL)
      {
         if (root.data() > n1 && root.data() > n2)
         root = root.right();
         else if (root.data() < n1 && root.data() < n2)
         root = root.left();
               else break;
      }
      System.out.println(root.data());
   }
```

b)
```
public void lca(Tree root,int n1, int n2)
   {
      while (root != NULL)
      {
         if (root.data() > n1 && root.data() < n2)
            root = root.left();
         else if (root.data() < n1 && root.data() > n2)
            root = root.right();
         else break;
      }
      System.out.println(root.data());
   }
```

c)
```
public void lca(Tree root,int n1, int n2)
   {
      while (root != NULL)
      {
         if (root.data() > n1 && root.data() > n2)
           root = root.left();
         else if (root.data() < n1 && root.data() < n2)
           root = root.right();
         else break;
      }
      System.out.println(root.data());
   }
```

d)
```
public void lca(Tree root,int n1, int n2)
   {
      while (root != NULL)
      {
         if (root.data() > n1 && root.data() < n2)
            root = root.left.left();
         else if (root.data() < n1 && root.data() > n2)
            root = root.right.right();
         else break;
      }
      System.out.println(root.data());
   }
```

4. What will be the output of the following C++ code?

```
#include<iostream>
using namespace std;
int main ()
{
  int cin;
  cin >> cin;
  cout << "cin: " << cin;
  return 0;
}
```

a) cin: garbage value  b) Error  c) Segmentation Fault  `d) Nothing is printed

5. What will be the output of the following code?

```
#include <iostream>
using namespace std;
int main()
{
   int arr[] = {1,2,3,4,5,6};
   int n = sizeof(arr)/sizeof(arr[0]);
   int d=4;
   int temp[10];

   for(int i=0;i<d;i++)
      temp[i]=arr[i];

   int j=0;
   for(int i=d;i<n;i++,j++)
      arr[j]=arr[i];

   int k=0;
   for(int i=n-d;i<n;i++,k++)
      arr[i]=temp[k];

   for(int i=0;i<n;i++)
      cout<<arr[i]<<" ";
   return 0;
}
```



a) 6 5 4 3 1 2  b) 5 6 1 2 3 4  c) 3 4 5 6 1 2  d) error

6. What is the functionality of the following piece of code?

Assume: ‘a’ is a non empty array of integers, the Stack class creates an array of specified size and provides a top pointer indicating TOS(top of stack), push and pop have normal meaning.

```
public void some_function(int[] a)
{
      Stack S=new Stack(a.length);
      int[] b=new int[a.length];
      for(int i=0;i<a.length;i++)
      {
          S.push(a[i]);
      }
      for(int i=0;i<a.length;i++)
      {
         b[i]=(int)(S.pop());
      }
      System.out.println("output :");
      for(int i=0;i<b.length;i++)
      {
         System.out.println(b[i]);
      }
}
```

a) print alternate elements of array

b) duplicate the given array

c) parentheses matching

d) reverse the array

7. What will be the output of the following C++ code?

```
#include <iostream>
using namespace std;
class Base {
   public:
   int m;
   Base(int n=0)
   {
      cout << "Base" << endl;
   }
};
class Derived: public Base
{
   public:
   double d;
   Derived(double de = 0.0)
   {
      cout << "Derived" << endl;
   }
};
```

```
int main()
{
   cout << "Instantiating Base" << endl;
   Base cBase;
   cout << "Instantiating Derived" << endl;
   Derived cDerived;
   return 0;
}
```

a) Instantiating Base
Base
Instantiating Derived
Base
Derived

b) Instantiating Base
Instantiating Derived
Base
Derived

c) Instantiating Base
Base
Instantiating Derived
Base

d) Instantiating Base

8. What will be the output of the following C++ code?

```
 #include <iostream>
using namespace std;
int array[10] = {0, 1, 2, 3, 4, 5, 6, 7, 8, 9};
void swap(int x, int y)
{
   int temp = array[x];
   array[x] = array[y];
   array[y] = temp;
   return;
}
void printArray(int size)
{
   int i;
   for (i = 0; i < size; i++)
      cout << array[i] << " ";
   cout << endl;
   return;
}
void permute(int k, int size)
{
   int i;
   if (k == 0)
      printArray(size);
   else
   {
      for (i = k - 1;i >= 0;i--)
      {
         swap(i, k - 1);
```

```
            permute(k - 1, size);
            swap(i, k - 1);
        }
    }
    return;
}
int main()
{
    permute(3, 3);
    return 0;
}
```

a) 0 1 2
   1 0 2

b) 0 2 1
   2 0 1

c) 2 1 0
   1 2 0

d) All of the mentioned

9. What will be the output of the following C++ code?

```
#include <iostream>
using namespace std;
class poly
{
    protected:
    int width, height;
    public:
    void set_values(int a, int b)
    {
        width = a; height = b;
    }
};
class Coutput
{
    public:
    void output(int i);
};
void Coutput::output(int i)
{
    cout << i;
}
class rect:public poly, public Coutput
{
    public:
    int area()
    {
        return(width * height);
    }
};
```

```
class tri:public poly, public Coutput
{
   public:

   int area()
   {
      return(width * height / 2);
   }
};
int main()
{
   rect rect;
   tri trgl;
   rect.set_values(3, 4);
   trgl.set_values(4, 5);
   rect.output(rect.area());
   trgl.output(trgl.area());
   return 0;
}
```

a) 1212 b) 1210 c) 1010 d) 1250

10. What is the number of edges present in a complete graph having n vertices?

a) (n*(n+1))/2 b) (n*(n-1))/2 c) n d) ) Information given is insufficient

11. What will be the output of the following C++ code?

```
#include <iostream>
#include <string>
using namespace std;
int main ()
{
  std::string str ("Sanfoundry.");
  str.back() = '!';
  std::cout << str << endl;
  return 0;
}
```

a) Sanfoundry.!

b) Sanfoundry.

c) Sanfoundry!

d) Sanfoundry!.

12. Following code snippet is the function to insert a string in a trie. Find the missing line.

```
private void insert(String str)
{
    TrieNode node = root;
    for (int i = 0; i < length; i++)
    {
        int index = key.charAt(i) - 'a';
        if (node.children[index] == null)
            node.children[index] = new TrieNode();

        ________________________
    }

    node.isEndOfWord = true;
}
```

a) node = node.children[index];

b) node = node.children[str.charAt(i + 1)];

c) node = node.children[index++];

d) node = node.children[index++];



13. What would be the solution to the given prefix notation?

* / + 1 2 / 4 2 + 3 5

a) 13.5

b) 7.5

c) 9

d) 12

14. What will be the output of the following C code?

```
#include <stdio.h>
int main() {
    typedef struct p *q;
    struct p
    {
        int x;
        char y;
        q ptr;
    };
    struct p p = {1, 2, &p};
    printf("%d\n", p.ptr->x);
    return 0;
}
```

a) Compile time error

b) 1

c) Depends on the compiler

d) Depends on the standard

15. What will be the output of the following C code?

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

a) 15, 4, 5

b) 9, 6, 9

c) 9, 3, 5

d) Undefined (Compiler Dependent)

# DBMS

1. A Boolean data type that can take values true, false, and_____

a)1

b)0

c) Null

d) Unknown

2. The creation of a stored program is similar to the definition of a _____

a) Trigger

b) Event

c) View

d) Table

3. A stored procedure is invoked using the statement _____

a) INVOKE

b) SEE

c) CALL

d) RETURN



4. How many of the following can be used in stored procedures?

PREPARE, EXECUTE, DEALLOCATE PREPARE

a) 0

b) 1

c) 2

d) 3

5. When transaction Ti requests a data item currently held by Tj, Ti is allowed to wait only if it has a timestamp larger than that of Tj (that is, Ti is younger than Tj). Otherwise, Ti is rolled back (dies). This is

a) Wait-die

b) Wait-wound

c) Wound-wait

d) Wait

6. In SQL the statement select * from R, S is equivalent to

a) Select * from R natural join S

b) Select * from R cross join S

c) Select * from R outer join S

d) Select * from R inner join S

7. In SQL statements cross-tabs are created using

a) Slice

b) Dice

c) Pivot

d) All of the above

8. Which of the following is used to denote the selection operation in relational algebra?

a) Pi

b) Sigma

c) Lambda

d) Omega



9. The subset of super key is a candidate key under what condition?

a) No proper subset is a super key

b) All subsets are super keys

c) Subset is a super key

d) Each subset is a super key

10. SELECT * FROM Products WHERE Price > ALL (SELECT Price FROM Products WHERE Price > 500);

When the query SELECT Price FROM Products WHERE Price > 500; returns no record, then which of the following query will be equivalent?

a) select * from Products;

b) select * FROM Products WHERE Price > 500;

c) SELECT * FROM Products WHERE Price <  ANY (SELECT Price FROM Products WHERE Price > 500);

d) No record

11. The most commonly used operation in relational algebra for projecting a set of tuple from a relation is

a) Join

b) Projection

c) Select

d) Union

12. Empdt1 (empcode, name, street, city, state, pincode). For any pincode, there is only one city and state. Also, for given street, city and state, there is just one pin code. In normalization terms, empdt1 is a relation in

a) 1NF only

b) 2 NF and hence also in 1 NF

c) 3NF and hence also in 2NF and 1NF

d) BCNF and hence also in 3NF, 2NF and 1NF

13 Select name, course_id from instructor, teaches where instructor.id=teaches.id;

This Query can be replaced by which one of the following?

a) Select name, course_id from teaches, instructor where instructor_id=course_id;

b) Select name, course_id from instructor natural join teaches;

c) Select name, course_id from instructor inner join teaches;

d) Both B and C

14. '_____ ' matches any string of _____ three characters. '___ %' matches any string of at _____ three characters.

a) At least, Exactly

b) Exactly, At least

c) At least, All

d) All, Exactly

15. How many types of joins

a) 3

b) 4

c) 5

d) 6

# OS

1. Number of chid process created in the following program is ?

```
#include <stdio.h>
#include <unistd.h>
int main() {
    if (fork() && (!fork())) {
        if (fork() || fork()) {
            fork();
        }
    }
    printf("2 ");
    return 0;
}
```

a) 4 b) 5 c) 6 d)0

2. Which of the following requires a device driver?

a) Register b) Cache

c) Main memory d) Disk

3. Consider three CPU-intensive processes, which require 10, 20 and 30 time units and arrive at times 0, 2 and 6, respectively. How many context switches are needed if the operating system implements a shortest remaining time first scheduling algorithm? Do not count the context switches at time zero and at the end.

a) 1 b) 2

c) 3 d) 4

4. What does wait operation in OS does?

```
wait(S)
{
}
```

a) while (S<=0);S--;

b) while (S>0) S--;

c) S++;

d) None of the above

5. Suppose a disk has 201 cylinders, numbered from 0 to 200. At some time the disk arm is at cylinder 100, and there is a queue of disk access requests for cylinders 30, 85, 90, 100, 105, 110, 135 and 145. If Shortest-Seek Time First (SSTF) is being used for scheduling the disk access, the request for cylinder 90 is serviced after servicing _____ number of requests.

a) 1

b) 2

c) 3

d) 4



6. Consider a main memory with five page frames and the following sequence of page references: 3, 8, 2, 3, 9, 1, 6, 3, 8, 9, 3, 6, 2, 1, 3. find the number of page fault respect to LRU?

a) 9 b) 10 c) 11 d) 12

7. Select which of the following statements is true?

a) Single system call can create more than one thread

b) Threads share data and information.

c) Process management takes more system calls.

d) All of these

8. Which of the following area contains static variables?

a) Stack b) Heap c) Data d) Both a & b

9. If Process A waits for cin operation to take place, then in which queue does Process A reside?

a) Process Queue

b) Device Queue

c) Ready Queue

d) IO Queue

10. Which scheduler takes place swapping of process?

a) Long term

b) Short term

c) Medium term

d) None of these

11. There are _ types of thread?

a) 2 b) 3 c) 4 d) 1

12. Let us assume that the user process is of size 2048KB and on a standard hard disk where swapping will take place has a data transfer rate around 1 MB per second. The actual transfer of the 1000K process to or from memory will take?

a) 2000ms b) 4000ms c) 1000ms d) None

13. Consider a computer with 8 Mbytes of main memory and a 128K cache. The cache block size is 4 K. It uses a direct mapping scheme for cache management. How many different main memory blocks can map onto a given physical cache block?

a) 2048

b) 256

c) 64

d) 8

14. Which of the following two operations are provided by the IPC facility?

a) Write & delete message

b) Delete & receive message

c) Send & delete message

d) Receive & send message

15. When you start up the computer the boot up storage at which the BIOS versions and manufacture and data are displayed on monitor is called as?

a) Bootstrap

b) Power on self test (POST)

c) System configuration

d) Kernel loading

# NETWORKS

1.Which one of the following is a network layer protocol?

a) UDP

b) TCP

c) Both A and B

d) ARP

2. Which one of the following task is done by data link layer?

a) Error control

b) Subnetting

c) Channel coding

d) Segmentation

3. Ethernet frame consists of

a) MAC Address

b) IP Address

c) Both A and B

d) None of the Above

4. The HTTP response message leaves out the requested object when _____ method is used.

a) GET

b) POST

c) HEAD

d) PUT

5. What is the maximum number of IP Addresses that can be assigned to hosts on a local subnet that uses the 255.255.255.224 subnet mask?

a) 31

b) 20

c) 24

d) 30

6. The topology with highest reliability is

a) Bus topology

b) Ring topology

c) Star topology

d) Mesh topology

7. Which class of IP address provides a maximum of only 254 host address per network ID?

a) Class A

b) Class B

c) Class C

d) Class D

8. What is the purpose of flow control?

a) To ensure that data is retransmitted if an acknowledgement is not received.

b) To provide a means for the receiver to govern the amount of data sent by the sender.

c) To reassemble segments in the correct order at the destination device

d) To regulate the size of each segment

9. Which of the following transport layer protocols is used to support electronic mail?

a) SMTP

b) IP

c) TCP

d) UDP

10. The address of a class B host is to be split into subnets with a 6-bit subnet number. What is the maximum number of subnets and the maximum number of hosts in each subnet?

a) 62 subnets and 262142 hosts.

b) 64 subnets and 262142 hosts.

c) 62 subnets and 1022 hosts.

d) 64 subnets and 1024 hosts.

11. The calculation time for the distance vector routing algorithm is _____ the one for the link state routing.

a) more than

b) less than

c) equal to

d) None of these

12. Checksum is used to

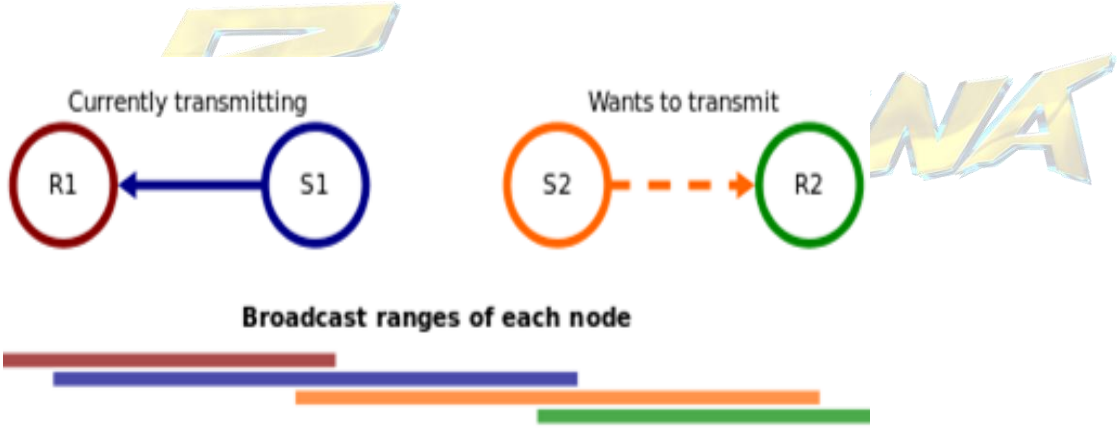
a) identify the receiver IP address

b) correct error

c) identify the port error

d) None of the above

13. The problem identified in the below picture is




a) Hidden Terminal

b) Exposed

c) Broadcast issue

d) No problem identified

14. Address size of IPv6?

a) 16 bytes

b) 32 bit

c) 64 bits

d) 128 bytes

15. Sender and client uses selective repeat protocol. Consider the following situation.

Sender sends the packet 1,2,3,4 to the receiver which in less than window size? Suppose packet 2 is lost? What will receiver do on receiving the packet 3?

a) Will discard

b) Store it since is less than window size

c) Sender won't send until ack of 2 is received

d) None of the above

# WEB PROGRAMMING

1. Find the output of the following code.

```
<!DOCTYPE html>
<html>
    <body>
        <p>
        Web programming
        refers to the writing,
        markup and coding
        involved in Web development,

         which includes Web content, Web client and server scripting and network security.
        </p>
    </body>
</html>
```

a) Web programming
refers to the writing,
markup and coding
involved in Web development,

which includes Web content, Web client and server scripting and network security.

b) Web programming refers to the writing, markup and coding involved in Web development, which includes Web content, Web client and server scripting and network security.

c) Web programming
refers to the writing,
markup and coding
involved in Web development,

which includes Web content, Web client and server scripting and network security.

d) Web programming refers to the writing, markup and coding involved in Web development, which includes Web content, Web client and server scripting and network security.

2. What is the expected file location of the html and php files to get exectued via lampp server in Ubuntu?

a) can be in any location

b) /opt/htdocs/lampp/

c) /opt/lampp/htdocs/

d) None of these

3. Find the tag(s) used to obtain the required output

My favourite color is ~~blue~~ red.

a) My favourite color is <del>blue</del> red.

b) My favourite color is <strike_through>blue</strike_through> red.

c) My favourite color is <strike>blue</strike> red.

d) Both a) and c)



4. What will be the command to print the number of characters in a string “ComputerTech” in JS ?

a) document.write(“ComputerTech”.len);

b) document.write(“ComputerTech”.length());

c) document.write(“ComputerTech”.length);

d) document.write(sizeof(“ComputerTech”));

5. Find the output of the following command line:

<bdo dir="rtl">HTML stands for Hyper Text Markup Language.</bdo>

a) .egaugnaL pukraM txeT repyH rof sdnats LMTH

b) HTML stands for Hyper Text Markup Language.

c) .Language Markup Text Hyper for stands HTML

d) LMTH sdnats rof repyH txeT pukraM .egaugnaL

6. Given a HTML code for ordered list. Find the approriate values of X and Y to obtain the desired output.

```
<ol type="X" start="Y">
        <li>Encapsulation</li>
        <li>Friend_class</li>
        <li>Garbage_collector</li>
</ol>
```

Output :

E. Encapsulation

F. Friend_class

G. Garbage_collector

a) X=A, Y=5

b) X=A, Y=E

c) X=E, Y=1

d) None of these

7. Which one of the following options produces the exact output while styling a table ?

| Firstname | Lastname |
|---|---|
| ABC | DEf |
| GHI | JKL |

a) border-collapse: collapse;

border-spacing: 10px;

b) border-collapse: separate;

c) border-collapse: collapse;

d) None of these

8. Predict the output of the following code:

```
<head>
        <p>Hi1</p>
</head>
<body>
        <p>Hi2</p>
</body>
```

a) Hi1 appears in the URL along the title of the page and Hi2 gets printed on the screen.

b) Hi2

c) Hi1

Hi2

d) Both b and c



9. Apart from <b> tag, what are the other tags used to make a text bold in HTML5?

a) <fat>

b) 

c) <emp>

d) <big>

10. Which one the following tag is used to attach external style sheets to html?

a) attach

b) href

c) include

d) link

11. Which one of the following is markup languages is used to create user-defined tags?

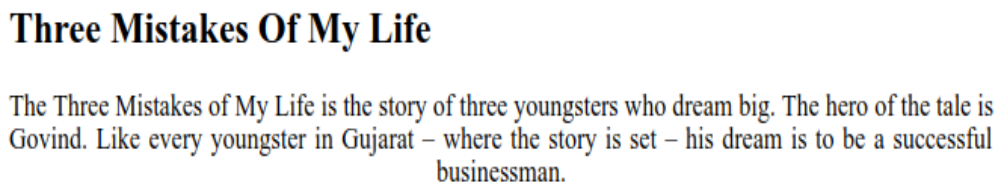
a) HTML

b) XML

c) XHTML

d) None of the above

12. Which one of the following property used to align the last line of the paragraph in the following manner?



**Three Mistakes Of My Life**

The Three Mistakes of My Life is the story of three youngsters who dream big. The hero of the tale is Govind. Like every youngster in Gujarat – where the story is set – his dream is to be a successful businessman.

a) text-align-last : center

b) text-last-align : center

c) text-last-align : justify

d) text-align-last : justify

13. Find the output of the following code:

```
<!DOCTYPE html>
<html>
<body>
<pre>
        <code>
        x=5;
        y=6;
        z=x+y;
        </code>
</pre>
</body>
</html>
```

a) 11

b) blank page

c) x=5;

y=6;

z=x+y;

d) None of these

14. Find the output of the following code

```
<?php
if(isset($_POST['submit']))
echo "hi";
?>
<html>
        <form  method="POST">
                <input type="text" id="name">
                <input type="submit" id="submit" name="submit">
        </form>
</html>
```

a) “hi” statement gets displayed in the next screen

b) No changes

c) Uncaught error due to link statement

d) Blank screen is displayed



15. Predict the output of the following code when Try it button is clicked:

```
<body>
<script>
        function myFunction()
        {
                document.getElementById("demo").innerHTML = 5+6+"7";
        }
</script>
<p id="demo"></p>
<button onclick="myFunction()">Try it</button>
</body>
```

a) 5+6+”7”

b) 5+6

c) 117

d) Empty screen

# SECURITY

1. Vicky digitally signs a message and sends it to Samantha. Verification of the signature by Samantha requires

a) Vicky's public key

b) Samantha's public key

c) Vicky's private key

d) Samantha's private key

2. Suppose that everyone in a group of N people wants to communicate secretly with the N–1 others using symmetric key cryptographic system. The communication between any two persons should not be decodable by the others in the group. The number of keys required in the system as a whole to satisfy the confidentiality requirement is

a) 2N

b) N(N-1)

c) N(N-1)/2

d) $(N-1)^2$

3. Which one of the following are used to generate a message digest by the network security protocols?

P) RSA

Q) SHA-1

R) DES

S) MD5

a) P and R only

b) Q and R only

c) Q and S only

d) R and S only

4. The minimum positive integer p such that ($3^p$ modulo 17) = 1 is

a) 5

b) 8

c) 12

d) 16

5. A sender is employing public key Cryptography to send a secret message to a receiver. Which one of the following statement is true?

a) Sender encrypts using receiver's public key

b) Sender encrypts using his own public key

c) Receiver decrypts using sender's public key

d) Receiver decrypts using his own public key

6. How many distinct stages are there in DES algorithm, which is parameterized by a 56-bit key?

a) 19 b) 18 c) 17 d) 16

7. A Trojan horse is

a) A piece of code that can attach itself to other programs in the system and spread to other systems when programs are copied or transferred.

b) A program that performs a legitimate function that is known to an operating system or its user and also has a hidden component that can be used for nefarious purposes like attacks on message security or impersonation.

c) A program that spreads to other computer systems by exploiting security holes like weaknesses in facilities for creation of remote processes

d) All of the above

8. Which one of the following algorithm is not used in asymmetric key cryptography?

a) RSA Algorithm b) Diffie-Hellman Algorithm

c) Electronic Code Book Algorithm d) None of the above

9. What is the number of possible 3 x 3 affine cipher transformations?

a) 168 b) 840 c) 1024 d) 1344

10. In the DES algorithm the round key is n bits and Round Input is m bits. What are the values of n and m respectively?

a) 48, 32 b) 64, 32 c) 56, 24 d) 32, 32

11. Which is the largest disadvantage of the symmetric Encryption?

a) More complex and therefore more time-consuming calculations

b) Problem of the secure transmission of the Secret Key

c) Less secure encryption function

d) Isn’t used any more

12. On Encrypting “thepepsiisintherefrigerator” using Vignere Cipher System using the keyword “HUMOR” we get cipher text

a) abqdnwewuwjphfvrrtrfznsdokvl

b) abqdvmwuwjphfvvyyrfznydokvl

c) tbqyrvmwuwjphfvvyyrfznydokvl

d) baiuvmwuwjphfoeiyrfznydokvl

13. A technique in which a program attacks a network by exploiting IP broadcast addressing operations is

a) Smurfing

b) Denial of service

c) E-mail bombing

d) Ping storm

14. In a RSA cryptosystem, a participant A uses two prime numbers p=13 and q=11 to generate his public and private keys. If the public key of A is 37, then the private key of A is

a) 18 b) 23 c) 11 d) 13

15. Pretty Good Privacy (PGP) is used in

a) Browser security

b) FTP security

c) Email security

d) None of the above