(10)

[This question paper contains 8 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 1024 C

Unique Paper Code : 32341102

Name of the Paper : Computer System Architecture

Name of the Course : **B.Sc. (H) Computer Science**

Semester : I

Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. **Section A** is compulsory.
3. Attempt any **four** questions from **Section B.**
4. Parts of a question must be answered together.

SECTION A

1. (a) Convert the hexadecimal number D5F2 to binary and octal number system. (2)

P.T.O.

(b) How can a D flip-flop be constructed using a JK flip-flop? Explain with the help of a block diagram. (2)

(c) How many 128×8 memory chips are needed to provide a memory capacity of 4096×16? (2)

(d) Represent the following decimal number 165.29 in BCD. (2)

(e) What is Hardwired control unit? (2)

(f) Differentiate between Program Counter and Address Register. (2)

(g) Represent the number $(+12.5)_{10}$ as a floating point binary number.with 16 bits. The normalized fraction mantissa has 9 bits, and the exponent has 7 bits. (3)

(h) Write micro-operations for implementing the following memory reference instructions :

(i) BUN: Branch Unconditionally

(ii) ISZ: Increment and Skip if Zero (4)

(i) Construct a 32 X 1 multiplexer using eight 4 X 1 multiplexers and one 8 X 1 multiplexer. Give block diagram and explain its working by means of a function table. (4)

(j) Given the following Boolean function : (4)

$F = XY'Z + X'Y'Z + XYZ$

(i) Simplify F using Boolean algebra

(ii) Draw the logic diagram of the simplified Boolean expression

(k) What is Program Controlled I/O? What is Interrupt Driven I/O? Give one disadvantage of each. (4)

(l) A digital computer has a common bus system for 16 registers of 32 bits each. The bus is constructed with multiplexers.

(i) How many selection inputs are there in each multiplexer?

(ii) How many multiplexers are there in the bus? (4)

P.T.O.

SECTION B

2. (a) Simplify the Boolean function F together with the don't care conditions d in sum-of-products form (SOP) and product-of-sums form (POS).

$F(w, x, y, z) = \Sigma(0, 1, 2, 3, 7, 8, 10)$

$d(w, x, y, z) = \Sigma(5, 6, 11, 15)$ (6)

(b) Perform the following arithmetic operations in binary :

(i) $(+42)_{10} + (-13)_{10}$

(ii) $(-42)_{10} - (-13)_{10}$

(Use signed 2's complement representation for negative numbers and 8 bits to accommodate each number together with its sign.) (4)

3. (a) An instruction is stored at location 256 with its address field at location 257. The address field has the value 400. A processor register R1 contains the number 200. Evaluate the effective address if

the addressing mode of the instruction is :

(i) Direct

(ii) Immediate

(iii) Relative

(iv) Register Indirect (4)

(b) Explain the following instructions giving two examples of each :

(i) Register Reference Instruction.

(ii) Input Output Instruction. (4)

(c) Specify the 14-bit binary control word that must be specified to the processor in terms of SELA, SELB, SELD and OPR to implement the following micro-operation :

$$R1 \leftarrow R3 + R4$$

(Given the binary code for OPR is 00101, and the three-bit binary code for the selecting the register corresponds to the register number.) (2)

P.T.O.

4. (a) A Computer uses a memory unit with 32768 words of 24 bits each. Every binary instruction is stored in one word of memory. The instruction has four parts: two bits to specify mode, two bits to specify a processor register, an operation code and an address part.

(i) Draw the instruction word format and indicate the number of bits in each part.

(ii) How many addressing modes and number of operations are supported?

(iii) Specify the number of bits required in each of PC, AC and IR. (6)

(b) A non-pipeline system takes 50 ns to process a task. The same task can be processed in a six-segment pipeline with a clock cycle of 10 ns. Determine the speedup ratio of the pipeline system for 100 tasks. What is the maximum speed up that can be achieved? (4)

5. (a) How is an interrupt processed in a computer? Explain with the help of interrupt cycle. (6)

(b) Using a general register computer with two address instructions, write a program to evaluate the arithmetic statement :

$$X = (C - D) * (E - F)$$ (4)

6. (a) The content of PC in the basic computer is 2AC (all numbers are in hexadecimal). The content of AC is 2EC3. The instruction format has three parts: mode, opcode and address. The content of memory at address 2AC is 832E. The content of memory at address 32E is 0821. The content of memory at address 821 is 8B9F. (Opcode 000 is for ADD operation, mode bit = 1 is for indirect addressing).

(i) Give block diagram of memory unit to give snapshot of the above representation and specify the instruction that will be executed.

(ii) Perform the binary operation in the AC when the instruction is executed. Also, specify the values of PC, AR, DR, AC and IR in hexadecimal at the end of the instruction cycle. (6)

P.T.O.

(b) Give block diagram of Direct Memory Access (DMA) controller. How does CPU initialize the DMA transfer? (4)

5

[This question paper contains 16 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 1060

Unique Paper Code : 32341101

Name of the Paper : Programming Fundamentals using C++

Name of the Course : **B.Sc. (Hons.) Computer Science**

Semester : I

Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Question No. **1** is compulsory in **Section–A**.
3. Attempt any **four** questions from **Section–B**.
4. Parts of a question should be attempted together.

SECTION A

1. (a) Write C++ declarations for the following : (4)

P.T.O.

(i) A function that accepts two integer pointers, one boolean variable and returns an integer.

(ii) Use function overloading to add two numbers when both are :

(a) Integer numbers

(b) Float numbers

and return type of both functions is void.

(b) Change the following while loop code fragment to an equivalent for-loop. (2)

```
cin >> temp;
while (temp != 0)
{
    cout << temp << endl;
    cin >> temp;
}
```

(c) Identify error in the following code segments. Also write the correct code. (6)

(i) const int x;

(ii) int flag = prime(int n);

(iii) int no of students = 15;

(d) Assume x = 6, y = 4 and z = 5. Find the values of x, y and z after evaluation of each of the following expressions. Assume that the execution of statements is independent of each other. (4)

(i) x++ + y

(ii) x && y || z

(iii) x – 2 * y + y < z * 2 / 3

(iv) (4 + 5 * y – 4) && (z – 2)

(e) Find error(s) and write the correct code, in the following programs: (4)

(i)
```
# include<iostream>
using namespace std;
class Sample
{
private:
```

```
    int a1, a2, a3;
    public:
    Sample(int i, int j, int k)
    {
     a1 = i;
     a2 = j;
     a3 = k; }
    void display() const
    {
     cout<<a1<< " "<<a2<< " "<< a3;
    }
};
int main( )
{
Sample s1(1, 2, 3), s2;
s1.display( );
s2.display( );
return 0;
}
```

(ii)
```
# include<iostream>
using namespace std;
class Sample2
{
 private :
    static int count;
 public :
    Sample2( )
 {
    count++;
 }
void display( ) const
  {
  cout<<count;
  }
};
int main()
  {
     Sample2 s1, s2;
     s1.display( );
```

a3;

```
    s2.display( );
    return 0;
}
```

(f) What will be the output of the programs given below : (5+5)

(i)
```
void fun (int x, int * y)
{
 x = 6;
 (*y) += 2;
}
 int main( )
{
 int a[5] = {2, 4, 6, 8, 10};
 int b = 5;
 for (int i = 0; i < 5; i ++)
{
 fun (a[ i ], &b);
 cout << a [ i ] << "\t" << b << endl;
}
 return 0;
}
```

(ii)
```
#include <iostream>
using namespace std;
void fun (int x)
{
  if (x < 10) throw 10.0;
}
int main ()
{
  try
  {
    fun (5);
  }
  catch (double value)
  {
    cout << value << endl;
  }
  return 0;
}
```

(g) (i) Name any two stream classes commonly used for file I/O.

(ii) Rewrite the following code using if-else statement-

```
int n, k = 5;
n = (100 % k ? k + 1 : k - 1);
cout << "n = " << n << " k = " << k << endl;
```

(2+3)

SECTION B

2. (a) Write a function findPrimes( ) that receives two numbers as arguments and displays all prime numbers between these two numbers. In case no arguments are passed, 2 and 20 should be treated as the default arguments.

Write main() program for calling the function findPrimes(), with –

(i) two arguments from the user

(ii) default arguments. (6)

(b) Write the definition of a function that accepts two arrays of integers, arr1 and arr2, as parameters. The function compares the two arrays for equality and returns true ox false. Assume that the size of both arrays is same. (4)

3. (a) What is the output of the following code segment? (5)

```
class A {
    int a;
public:
A() {
    a = 0;
    cout << "\nIn A";
}
A(int x){
    a = x;
    cout << "\nIn A with a = " << a;
}
~A() {  cout << "\nDestroying A"; }
};
```

```
class B : public A  {
        char b;
    public:
      B( )   {
            b = 0;
            cout << "\nIn B";
       }
       B(char x) {
            b = x;
            cout << "\nIn B with b = " << b;
       }
     ~B( )  { cout << "\nDestroying B";  }
};
int main( )
{
    B obj1('z');
    A obj2(10);
    return 0;
}
```

(b) What is the purpose of static members of a class? Explain with suitable example. (5)

4. (a) What is run time polymorphism? Explain it with the help of suitable example. (5)

(b) A point on the two-dimensional plane can be represented by two numbers: (5)

an x coordinate and a y coordinate.

Write a program that declares a class called Point to model a point in 2-D plane. The class comprises of the following:

(i) Two private data members to store the x andy coordinates.

(ii) A parameterised constructor for setting the values for the data members.

(iii) Overload + operator as a member function to add two Point objects P1 and P2 (the sum of two points can be defined as a new point whose x coordinate is the sum of the x coordinates of the two points, and whose y coordinate is the sum of the y coordinates).

5. (a) Differentiate between Constructor and Copy Constructor. Give three situations in which a copy constructor is used. (5)

(b) Consider the following declarations and answer the questions given below : (5)

```
class Animal
{
int leg:
protected:
int tail;
public:
void input(int);
void out( );
};
class Wild : private Animal
{
int carniv;
protected:
int teeth;
```

```
public:
void indata (int, int)
void outdata( );
};
class Pet : public Animal
{
int herbiv;
public:
void display (void);
};
```

(i) Name the derived class of the class Animal.

(ii) Define the statements to declare the objects of class Animal, Wild and Pet. Write suitable statements for the data members of classes that are accessible in main(). Give the reasons for the data members that are not accessible in main().

6. (a) Write a program to find the factorial of a number. Number should be entered as a command line argument. (3)

(b) Define an Abstract class. Can we create objects of an abstract class? (2)

(c) Write the output of the following code, assuming that user has entered zero and negative value for the variable num2 : (5)

```
#include <iostream>
using namespace std;
int quotient (int first, int second);
int main( )
{
int num1, num2, result;
for (int i = 0; i < 3; i++)
{
cout << "Enter an integer: ";
cin >> num1;
cout << "Enter another integer: ";
cin >> num2;
try
{
cout << "Result: " << quotient (num1, num2) << endl;
}
catch (int ex1)
{
cout << "Division by zero cannot be performed." <<
endl;
```

```
}
catch (char ex2)
catch (char ex2)
{
cout << "Division by negative number cannot be
performed." << end1;
}
}
return 0;
}
// Function definition
int quotient (int first, int second)
{
char ch= 'y';
if (second == 0)
{
throw 0;
}
if(second < 0)
{
throw ch;
}
return first / second;
}
```

7. (a) Write a program that reads a file and prints the number of lines in it. (5)

(b) What is the output of the following code segment? (5)

```
string s1 = "Hello", s2 = "There!!!",
s3 = "How are you?";
string s = s1 + " " + s2 + " " + s3;
cout << s << endl;
cout << s.length() << endl;
cout << s.substr(7, 3) << endl;
cout << s3.find("are") << endl;
s1.replace(1, 4, "i");
cout << s1 << endl;
cout << s3.find_last_of('o') << endl;
```

[This question paper contains 12 printed pages.]

Your Roll No. 2019550110

Sr. No. of Question Paper : 1374 **C**

Unique Paper Code : 32341301

Name of the Paper : Data Structures

Name of the Course : **B.Sc. (Hons.) Computer Science**

Semester : III

Duration : 3 Hours Maximum Marks : 75

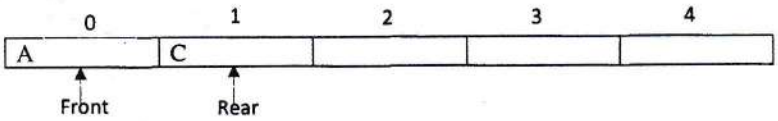
Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Question No. **1** of **35** marks is compulsory.
3. Attempt any **Four** questions from Q. No. **2** to Q. No. **7**.

1. (a) Give necessary class definitions to create a circular linked list. Write a member function to remove a node following the cursor node in the circular linked list. (5)

P.T.O.

(b) Consider the following array-based queue of size 5 :



Show the contents of the queue with position of Front and Rear after each of the following operations done in sequence.

(i) Insert X

(ii) Remove two letters

(iii) Insert Y and Z

(iv) Insert W

(v) Remove one letter (5)

(c) Consider an electronic mathematical calculating device that is used to evaluate any mathematical expression but does not recognize parenthesis. The device is given the following mathematical

expression as input. ($ represents exponent operator): ((A* (B–C) +D) $F+E)

The calculating device upon receiving the expression start converting it into a parenthesis free notation step by step using some algorithm before evaluating it. Which data structure the calculating device would use in the algorithm. Show the steps of the algorithm used by the calculating device and give the parenthesis free notation that the calculating device would have generated. (5)

(d) A dictionary of following word's is to be maintained in memory such that searching is quick :

eye,ice,ant,cat,bat,dog,log,fog,leg,zip,yogart,wolf, top,unknown,xor

Answer the following :

(i) Which hierarchical data structure would you suggest for this dictionary?

(ii) Show diagrammatically, the dictionary created using your suggested data structure.

(iii) Give the number of comparisons that would be done to search the word xor in the above dictionary. (5)

(e) Define the following member functions for a vector V using an array A:

(i) insert (i, e) to insert a new element e into vector V at index i.

(ii) erase (i) to remove the element at index i from vector V. (5)

(f) A magician showed a trick to store some numbers in the range [1000, 9999] in a crate of size 20. The 20 positions in crate are numbered from 0 to 19. The magician decides where to put the number based on the two middle digits of the number. If the position in the crate is already occupied, magician puts the number in the next available free position of the crate in linear order. When

asked to pick up any number, the magician is able to pick up number without much searching. Devise the trick used by magician and find out the locations where the following numbers would have been stored 1226, 7242, 6867, 8220, 1161, 4444, 6221, 5288, 7465 and 8280. (5)

(g) Differentiate between max-heap and min-heap. Build a min-heap H using following data:

60, 33, 50, 22, 55, 40, 11, 22, 65, 30.

Show heap after each insertion. (5)

2. (a) Consider some data stored in a 2D array A of size 4×4. Each element requires 2 bytes of memory storage. Base address of data is 2005. Write mapping functions, determine the index value and memory location of A [2] [3] when array is stored in:

(i) Row major

(ii) Column major (5)

$b + [i \times n + j] \times size$

$2005 + [2 \times 5 + 3] \times 2$

$2005 + 13 \times 2$

$2005 + 26$

2031

$b + (j \times n + i) \times size$

$2005 + (3 \times 5 + 2) 2$

$2005 + 34$

2039

(b) Consider some students, seated randomly in a class. The students are required to perform on stage in increasing order of their heights, such that every time a student is called on stage, the teacher calls the shortest student out of all the remaining students to go on stage. Show the steps of the algorithm the teacher follows if the heights (in cms) of the students seated on the first 10 chairs in the class are given as :

Chair no.	1	2	3	4	5	6	7	8	9	10
Height in cms.	160	157	152	149	150	159	162	145	155	140

How many students the teacher has to examine at the end to determine the correct sequence in which the students are called to perform on stage?

(5)

3. (a) Give Output. (4)

(i) Consider the linked list:

6–>4–>3–>1–>2–>7–>NULL

Singly

Give the output of the below function fund if 'func1' is invoked as func1 (p) where p is a node pointer pointing to node 6 in the above linked list.

```
Void fun1(node *p)
 {
  if(p==NULL)
      return;
   fun1(p->next->next);
   cout<< p->data+1;
 }
```

7 2 1 3 4 6

(ii) Consider the linked list :

1->2->3->4->5->6-> NULL

Give the output of the below function func2 if 'func2' is invoked as func2 (s) where s is a node pointer pointing to node 2 in above linked list.

```
Void fun2(node *s)
 {
   if(s==NULL)
      return;
   cout<< s->data;
   if(s->next!=NULL)
      fun2(s->next->next)
   cout<< s->data;
 }
```

(b) Write functions for the following :

(i) Remove an element x from a doubly linked list of integers.

(ii) Merge two singly linked lists of integers into one list. (6)

4. (a) Consider the following recursive function : (5)

```
Double calc(int x, int n)
{
    if(n=0)
        return 1;
    else
        return x*calc(x,n–1);
}
```

(i) What will be the output if function is invoked as calc (5, 4)?

(ii) How many recursive calls will be performed to compute calc(5, 4)?

(iii) Write the iterative version of the above function.

(b) Consider the following recursive function of tree traversal : (5)

```
traverse(node *p)
{
    if(p ! = 0)
    {
```

```
        traverse(p->left);
        traverse(p->right);
        visit(p);
      }
  }
```

Write non-recursive / iterative tree traversal function of the given recursive function.

5. (a) Write a function to find in-order predecessor of a node in a binary search tree. (5)

(b) Consider implementing double ended queue (deque) in three different ways using Array, singly linked list, and doubly linked list. Give running time complexity of all the below operations for all the three implementations. (5)

(i) insertFront(e)

(ii) insertBack(e)

(iii) deleteFront()

(iv) deleteRear()

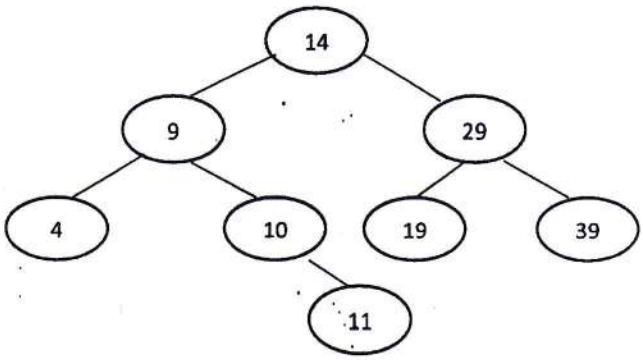
Which of the above three implementation ways is the most efficient? Justify.

6. (a) Create a balanced multiway search tree of order 5 using following integers

6, 4, 22, 10, 2, 14, 3, 8, 11, 13, 5, 9, 15, 18, 21, 1

Show the content of tree after each insertion. Delete element 11 and show the tree after deletion. (6)

(b) Consider the following binary search tree (BST):



Apply two approaches 'deletion by merging' and 'deletion by copying' to delete the root node. Compare both the trees after deletion in terms of height. (4)

P.T.O.

7. (a) Consider the following keys to be inserted in an AVL tree in given order :

H, I, J, B, A, E. Show each step. What will be the height of the created AVL tree? (6)

(b) Write a function to reverse the contents of a stack using additional queue. Assume that classes for stack and queue are defined. (4)

[This question paper contains 8 printed pages.]

Your Roll No.....X.....

Sr. No. of Question Paper : 1402 **C**

Unique Paper Code : 32341302

Name of the Paper : Operating Systems

Name of the Course : **B.Sc. (H) Computer Science**

Semester : III

Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. **Section A** is compulsory. Attempt any **4** questions from **Section B**.
3. Parts of a question must be answered together.

SECTION A

1. (i) Which algorithm is the preemptive version of First in First out CPU scheduling algorithm? (1)

   (ii) What is the name given to the section of code or set of operations in which process is working on its shared variables? (1)

P.T.O.

(iii) What is 'Dirty bit' in Demand paging? Where this bit is stored by the Operating System? (2)

(iv) Why command interpreter is usually placed separate from the kernel? (2)

(v) Write any two problems that may occur in multiprogramming environment? (2)

(vi) How degree of multiprogramming affects CPU performance? (2)

(vii) Explain the type of fragmentation that occurs in segmentation? (2)

(viii) Using semaphores, how can we achieve the condition of having statement 'a' of process P1 to be executed only after 'b' condition of process P2. (2)

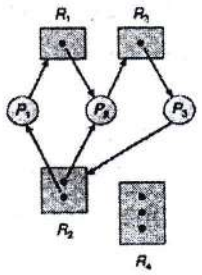
(ix) List any two privileged instructions? (2)

(x) What is the significance of two separate modes of operation in operating systems? (2)

(xi) Which are the two conditions under which a parent may terminate the execution of one of its children? (2)

(xii) Write the bit vector representation for free space list for a disk (10 blocks) where blocks 1, 2 and 5 are free and rest of the blocks are allocated. Give one advantage of this representation. (2)

(xiii) Determine whether the deadlock occur in the given resource 3 allocation graph of three processes as P_1, P_2 and P_3 and four resources as R_1 (one instance), R_2 (two instance), R_3 (one instance) and R_4 (3 instances)? Justify your answer. (3)



(xiv) How many child processes are created in the following fragment of code assuming essential header files are included? Explain the output with justification.

```
int main()
  {
  for (int i=0;i<4;i++)
     fork();
  return 0;
  }
```

(1+2)

P.T.O.

(xv) Consider a system of five resources (assuming every resource is having one instance only) and four processes where every process requires two resources to complete its work. Is there any chance of deadlock in this scenario? Justify your answer after applying all the necessary conditions of deadlock. (3)

(xvi) Consider a logical address space of 512 pages with 4-KB page size, mapped onto a physical memory of 128 frames.

(a) How many bits are required in the logical address?

(b) How many bits are required in the physical address? (2+2)

SECTION B

2. (i) Consider the following set of processes, with length of the CPU burst and arrival time given in milliseconds :

Processes	Burst Time	Arrival Time
P1	9	0
P2	5	2
P3	6	3
P4	4	5
P5	8	6

(a) Draw the Gantt chart illustrating the execution of these processes using Shortest Remaining Time First (SRTF) algorithm? (3)

(b) Based on the above obtained Gantt chart, calculate the average turnaround time and average waiting time for the given processes. (3)

(ii) Illustrate with an example if the wait and signal operations are not executed atomically, then mutual exclusion is violated? (4)

3. (i) Differentiate the following :

(a) Long term schedular and Short term schedular

(b) Asymmetric multiprocessing and Symmetric multiprocessing

(c) Monolithic and Microkernel approach to Operating system design (3×2)

(ii) Consider the following page reference string :

7,0,3,1,5,2,3,4,0,7,2,1,0,4,2,0,1,7

Assuming demand paging with three frames, how many page faults would occur for the following page replacement algorithms :

(a) Optimal replacement

(b) FIFO replacement (4)

4. (i) Consider the following segment table :

Segment	Base	Length
0	219	600
1	1300	95
2	90	400
3	1327	480
4	1052	196

What are the physical addresses for the following logical addresses?

(a) 0, 230

(b) 1, 10

(c) 2, 300

(d) 3, 400

(e) 4, 200 (5)

(ii) For a paged system, Translation Lookaside Buffer (TLB) hit ratio is 80%. Let RAM access time, t is 20 ns and TLB buffer access time, T is 100 ns. Find out

(a) Effective memory access with TLB

(b) Effective memory access without TLB (3)

(iii) Justify the requirement of logical and physical addresses in an operating system? (2)

5. (i) What is race condition in process synchronization? Explain it with an example. (4)

(ii) Consider a disk drive of 5000 cylinders, numbered from 1 to 4999. (6)

The drive is currently serving a request at cylinder 143, and the previous request was at

cylinder 125. The queue of pending request in FIFO order is 86, 1470, 913, 1774, 948, 1509

Starting at current head position, what is the total distance (in cylinders) that the disk arm moves to satisfy all pending requests for each of the following disk scheduling algorithms.

(a) Shortest seek time first (SSTF)

(b) Circular SCAN (C-SCAN)

Give all the intermediate calculations.

6. (i) Compare and contrast the following : (4)

(a) Peer to Peer Computing and Client-Server Computing

(b) Data parallelism and Task parallelism

(ii) What is the role of virtualization in cloud computing? (4)

(iii) Compute the context switch time for a user process of 100 MB using the swapping memory management scheme, if the backing store has a transfer rate of 50MB per second. (2)

[This question paper contains 8 printed pages.]

Your Roll No.....

C

Sr. No. of Question Paper : 1402

Unique Paper Code : 32341303

Name of the Paper : BHCS12 - Computer Networks

Name of the Course : **B.Sc. (H) Computer Science (CBCS-LOCF)**

Semester : III

Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. **Section A** is compulsory and carries **35** marks.
3. Attempt any four questions from **Section B**.
4. **All** questions carry equal marks.

SECTION A

1. (a) Consider a selective repeat sliding window protocol that uses a frame size of 1 KB to send data on a 1.5 Mbps link with a one-way latency of 50 msec. To achieve a link utilization of 60%, what is the minimum number of bits required to represent the sequence number field. (3)

P.T.O.

(b) Give any one difference between port address, physical address and logical address? (3)

(c) Suppose the following character encoding is used in a data link protocol : (2)

A: 11010111; B: 11101101; FLAG: 01111110; ESC: 10100011.

Consider the character frame: A B ESC B ESC ESC FLAG

Show the bit sequence transmitted (in binary) for the above character frame when Flag bytes with byte stuffing framing methods is used.

(d) Explain the significance of the following special IP addresses :

(i) 127.0.0.0

(ii) 255.255.255.255 (2)

(e) Explain the difference between packet switching and circuit switching with the help of suitable example. (3)

(f) How are IP addresses resolved from a given URL? (3)

(g) Five channels each with a 100 KHz bandwidth are to be multiplexed together. What is the minimum bandwidth of the link if there is a need for a guard band of 10 KHz bandwidth channels to prevent interference. (2)

(h) In a given modulation scheme, there are 4 amplitude levels and 16 phase levels and the bit rate (N) is 72 Kbps. Calculate the following:

(i) Number of bits per baud (r)

(ii) Baud rate (S) (2)

(i) Indicate True or False for each of the following :

(i) Switches in circuit-switched networks involve connection establishment and connection release.

(ii) Switches in circuit-switched networks do not need any information about the network topology to function correctly. (2)

(j) What is the benefit of "twisting" in twisted-pair cables? (2)

(k) What is the purpose of PSH and SYN flag bits with respect to TCP header? (2)

(l) What do you mean by well-known ports? Mention the port numbers assigned to HTTP and SMTP. (2)

(m) Assume six devices are arranged in a mesh topology. How many ports are needed for each device? How many physical links are needed in full duplex mode? (2)

P.T.O.

(n) Which of the four digital to analog modulation techniques (ASK, FSK, PSK) is most susceptible to noise? Justify your answer. (2)

(o) Map the following to a suitable layer of the OSI model :

(i) Route determination

(ii) Interface to transmission media

(iii) Provides access to the end user (3)

SECTION B

2. (i) Consider a coding scheme with two legal codewords: 01010 and 10101.

(a) Calculate its Hamming distance.

(b) How many bit errors can be detected by this code?

(c) How many bit errors can be corrected by this code? (3)

(ii) A 12-bit even-parity Hamming code whose binary value is 111001001111 arrives at a receiver. What was the original value of the message? Assume that not more than 1 bit is in error. (3)

(iii) Explain and discuss the various fields of IP header with the help of a diagram. (4)

3. (i) HyperText Transfer Protocol (HTTP) is a stateless protocol. Justify. (2)

(ii) A router has the following (CIDR) entries in its routing table : (2)

Address/mask	Next hop
135.46.56.0/22	Interface 0
135.46.60.0/22	Interface 1
192.53.40.0/23	Router 1
default	Router 2

For each of the following IP addresses, find the next hop selected by the router?

(a) 135.46.63.10

(b) 192.53.56.7

(iii) Two CSMA/CD stations are each trying to transmit long (multiframe) files. After each frame is sent, they contend for the channel, using the binary exponential backoff algorithm. Explain the functionality of the algorithm in brief. (3)

P.T.O.

(iv) Compare and contrast Transmission Control Protocol (TCP) and User Datagram Protocol (UDP) with respect to the following parameters:

(a) Connection

(b) Sequence of Data packets at the receiver

(c) Acknowledgement of the received packets (3)

4. (i) Compute the Nyquist Sampling rate for a signal with bandwidth of 200 KHz if the lowest frequency is 100 KHz. (2)

(ii) Differentiate between static and dynamic routing with the help of suitable example. (3)

(iii) A message M(x) 1101101101 is transmitted using the CRC method. The generator polynomial is $x^3 + 1$. (3+2)

(a) Compute the transmitted bit string which includes the message and CRC.

(b) Suppose that the fifth bit from the left is inverted during transmission. Show that this error is detected at the receiver's end.

5. (i) Suppose a 9000-byte IP packet is forwarded across a link with a 1500-byte Maximum Transmission Unit (MTU). How many fragments will be created ? What are their lengths? (2)

(ii) How can a machine with a single DNS name have multiple IP addresses? (2)

(iii) Consider the IP address 184.86.92.182,

(a) Find the class of the given IP address, if we are using class-based addressing.

(b) If the network in part (a) is to be divided into 8 different subnets, what would be the subnet mask?

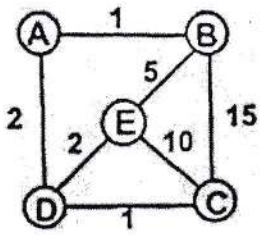
(c) What is the network address of the subnet to which this IP address would be attached?

(d) For CIDR addressing, find the length of CIDR prefix for the network in part (c). (1+2+2+1)

6. (i) What is the importance of flow control in the context of network communication? Suggest any one technique used to handle the issue of flow control. (3)

(ii) Briefly discuss the concept of multiplexing. Differentiate between Time Division and Frequency division Multiplexing. (3)

(iii) Consider the network shown below and assume that each node initially knows the costs to each of its neighbors. Consider the distance vector algorithm and show the distance table entries at node E. (4)



7. (i) Why is the header checksum of an IP packet computed at every hop from source to destination? (2)

(ii) DNS uses UDP instead of TCP. If a DNS packet is lost, there is no automatic recovery. Does this cause a problem, and if so, how is it solved? (2)

(iii) State Optimality Principle. (3)

(iv) Explain the concept of transmission impairment? Briefly, discuss the difference between distortion and attenuation. (3)

(1500)

[This question paper contains 8 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 1006 **C**

Unique Paper Code : 32341501

Name of the Paper : Internet Technologies

Name of the Course : **B.Sc. (H) Computer Science**

Semester : V

Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. **Section A** is compulsory.
3. Attempt any **FOUR** questions from **Section B**.

SECTION A

1. (a) Explain the following Networking Protocols with an suitable example :

   - ipconfig
   - tracert (4)

P.T.O.

(b) Write the network address, broadcast address, valid host addresses and subnet mask for the IP address. 198.2245.173/26 (4)

(c) What do you understand by Proxy Server? Write any two advantages of using it. (4)

(d) Explain setTimeout() and setInterval() functions with examples. (4)

(e) Write any four differences between Forum and Blog. (4)

(f) Given the JSON object: (2)

```
myJson = {  "name" : "nested",
            "marks" : 45,
            "Item" : ["food" , "clothes" , {"a" : true}]
         }
```

Write the value of a.

(g) Write a JavaScript program to Greet the user based on the current time. (3)

(h) Explain the difference between static routing and dynamic routing. (3)

(i) You need to subnet a network that has 5 subnets, each with at least 16 hosts. Which of the following subnet masks are valid in the above situation?

(i) 255.255.255.192

(ii) 255.255.255.224

(iii) 255.255.255.240

(iv) 255.255.255.248 (2)

(j) What are cookies? Explain Sessions in a cookie. (3)

(k) Define JSON.stringify() and JSON.parse() functions. (2)

SECTION B

2. Write short notes on following : (10)

(i) Crawling

(ii) Indexing

(iii) Internet Protocols

P.T.O.

(iv) Internet Vs. Intranet

(v) Domain Name Server

3. Given the list : (10)

- John
- Merry
- Martian
- Ketty

Write statements using JQuery to perform the following functions :

(i) Add two names "Mat" and "Damon" in the above list such that the resultant list appears as follows:

- Mat
- John
- Merry
- Martian
- Ketty
- Damon

(ii) Add surnames to the names in the list such that the resultant list appears as follows :

- Mat Jonas
- John Mathew
- Merry lane
- Martian steven
- KettyGadot
- Damon Hartley

(iii) Add a class as "MyName" to each of the list item.

(iv) Give a background color to the list.

(v) Clicking on a list item should change its background color.

4. (a) What is Network address translation and why do we need it. Explain with a suitable example. (5)

(b) What is a JSON object? Write the syntax to add a JSON object to define a student having details: name of the student, university roll number, course name, mobile number and email. (5)

5. (a) Explain following Bootstrap elements : (5)

- Pagination
- List Groups
- Panels
- Navbar
- Dropdowns

(b) Create an HTTP Server using Node.js which handles requests on port 8000. Create auser.html file with two forms Register and Login. On clicking login option, form must search for credentials of the user in MYSQL database. On successful login, a Welcome page should be displayed. On clicking Register option, form must insert the user's credentials in MYSQL database. On successful Registration, the user must return to the user.html page. (5)

6. (a) Create an HTML page with one input field, one radio button and a text field for display. The first input field will take a mathematical expression as input. The two radio buttons will be displayed as SQUARE and DOUBLE. Whichever option is selected by the user, the result of the mathematical expression as entered by the user, will be squared or doubled and the corresponding answer should be displayed in the text field. (5)

(b) Create a form that takes data about a customer. The form must be well designed and should accept the customer's FirstName, LastName, Age, Birthday and FoodPreferences. At the submission of this form, create a Customer object in JavaScript using the above values and an equivalent JSON object. Print both these objects on the console. Using AJAX, display the data of two customers in a presentable way. (5)

7. (a) What are the various components of an email? Define the mail message format of SMTP. Also discuss the functionalities of any TWO mail access protocols. (5)

(b) What are event listeners? Why it is used. Explain it with an example. (5)

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[This question paper contains 8 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 1042 C

Unique Paper Code : 32341502

Name of the Paper : Theory of Computation

Name of the Course : **B.Sc. (Hons.) Computer Science**

Semester : V (Admissions 2019-2021)

Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Question No. **1 (Section A)** is compulsory.
3. Attempt any **four** Questions from Nos. **2** to **7 (Section B)**.
4. Parts of a question must be answered together.
5. Consider $\Sigma = \{a, b\}$ for all the questions unless specified otherwise.

SECTION A

1. (a) Let **s = {aa, bb}** and **T = {aa, bb, bbaa}**. Show that **S*=T***. Does the string **aaa** belong to the language **S***? Justify. (3)

P.T.O.

(b) Consider the following Context Free Grammar (CFG) :

S -> SAbAbAbA | λ

A -> aA | λ

Describe the language generated by given CFG. List any two words of the language. (3)

(c) Construct a regular expression defining each of the following languages :

(i) L1= {words in which a appears tripled (in clumps of 3) if at all}

(ii) L2= {ends with a and does not contain the substring bb} (4)

(d) Describe the language defined by each of the following regular expressions:

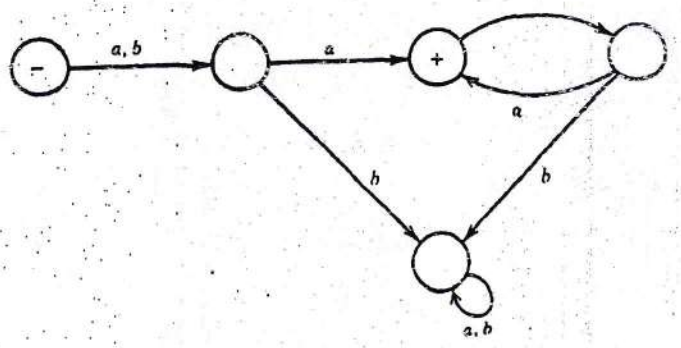
(i) bba*b

(ii) ((a+b) a) *

Also, determine the shortest word in the language. (4)

(e) Build a finite automaton that accepts the language of words having exactly four letters. (4)

(f) Describe the language accepted by following finite automaton : (2)



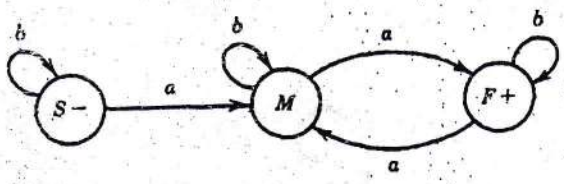
(h) Using pumping lemma, show that the following language is a non-regular language : (4)

$\{a^n ba^{2n}$ where $n \geq 1\}$ = {abaa, aabaaaa, aaabaaaaaa,...}

(i) Construct a deterministic PDA for the language L_3= $\{a^n S$ where S starts with b and length (S) = n} (4)

(j) Construct the context free grammar (CFG) for the language accepted by following finite automaton : (3)

P.T.O.

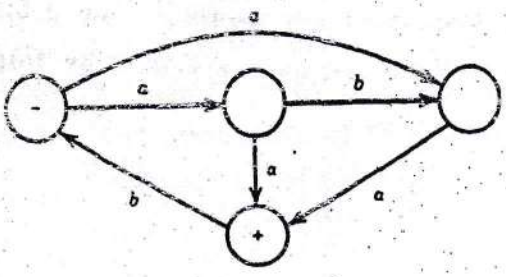


(k) Design a right shifting hiring machine. Assume the initial configuration to be ⊳␣w␣ and desired output configuration to be ⊳␣␣w␣. (4)

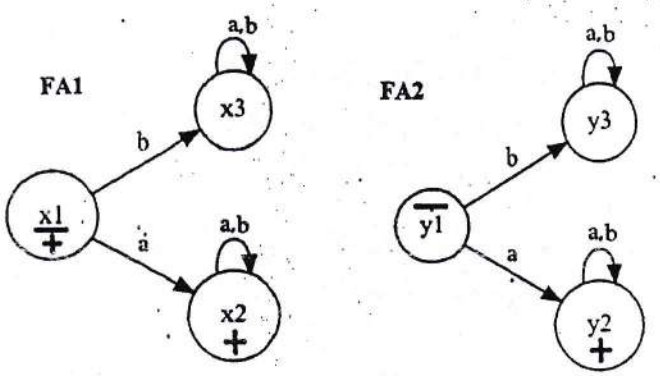
SECTION B

2. (a) Consider the following language of all the words defined over having $\Sigma = \{a, b\}$ comprising only b's including empty string λ. Build a finite automaton FA that accepts the given language and find its kleene closure i.e. $(FA)^*$. (6)

(b) Convert the following non-deterministic finite automaton to deterministic finite automaton: (4)



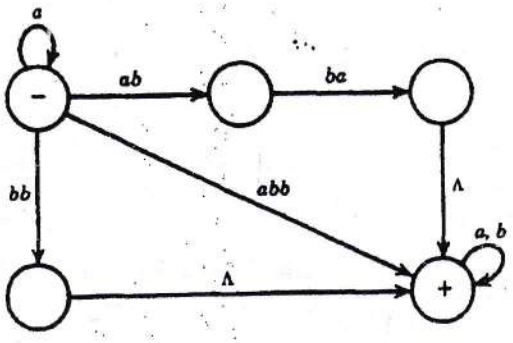
3. (a) For the following pairs of FAs, build a finite automaton that accepts the intersection of languages defined by FA1 and FA2. Also, build a finite automaton that accepts the complement of the language defined by FA1. (6)



(b) Show that the set of regular languages are closed under union and kleene closure using non-deterministic finite automata. (4)

4. (a) Using the bypass theorem, convert the following transition graph into a regular expression : (6)

P.T.O.

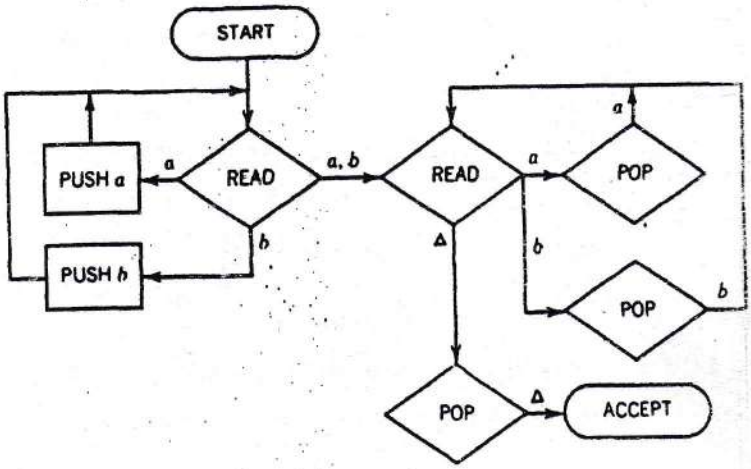


(b) Use pumping lemma to prove that the language $\{a^n b^n c^n$ where n=1, 2, 3, 4, 5....$\}$ is non-context free language. (4)

5. (a) For the Push Down Automata shown below :

(i) Describe the language accepted by it.

(ii) Is the given PDA deterministic or non-deterministic? (4)



(b) Construct a PDA for the language $a^n b^q a^m$ where m, n>=1 and q=m+n. (6)

6. (a) Consider the following context free grammar :

S -> AbB

A -> aA| λ

B -> aB | bB| λ

Construct an equivalent CFG by eliminating all λ productions and convert the resultant grammar into chomsky normal form (CNF). (4)

(b) Write the CFG for the language containing all words which are palindromes excluding the null string. Create a parse tree for the word abaaba. (4)

(c) Show that the following CFG is ambiguous: (2)

S -> XaXaX

X -> aX | bX | λ

7. (a) Assume Σ = {0, 1}. Design a standard turing machine M that computes one's complement of the binary number on the input tape. Assume the

initial configuration to be ⊳␣w (if the input is ⊳␣w, the output should be ⊳␣w′, where w′ is the one's complement of w). Show the trace of above turing machine M on the string ⊳␣0110. (5)

(b) Prove that if a language is recursive, it is also recursively enumerable. (2)

(c) Consider the Turing Machine M = (K, Σ, δ, s, {h}), where K = {s,q,h}, Σ = {␣, ⊳, a} and δ is given in the following table :

state,	symbol	δ
s	a	$(q, \sqcup)$
s	$\sqcup$	$(h, \sqcup)$
s	$\triangleright$	$(s, \rightarrow)$
q	a	(s, a)
q	$\sqcup$	$(s, \rightarrow)$
q	$\triangleright$	$(q, \rightarrow)$

Give the representation of Universal Turing machine for M. (3)

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[This question paper contains 12 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 1095 **C**

Unique Paper Code : 32347507

Name of the Paper : Data Analysis and Visualisation

Name of the Course : **B.Sc. (Hons.) Computer Science**

Semester : V

Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Question No. **1** is compulsory.
3. Attempt any **four** questions out of Q. **2** to Q. **7**.
4. Parts of a question must be answered together.

1. (a) Give output of the following code.

(i) import pandas as pd (2)

P.T.O.

```
obj3 = pd.Series(['wow', 'good', 'great'],
        index=[0, 2, 4])
obj3.reindex(range(6), method='ffill')
obj3
```

(ii)
```
matrix =[[j for j in range(3)]for i in range(3)]
print(matrix)
```
(2)

(iii)
```
import pandas as pd
df=pd.DataFrame[[1,1,1], [2,2,2], [1,2,1],
[2,1,1]],index=['one','two','three','four'],
columns=pd.Index(['A','B','C'],name='MyPlot'))
```

Give the output for df.plot.bar(). (2)

(b) What is a pivot table? Give one example. (2)

(c) Provide the output of following codes. (3)

Given the value of string object s=3.1456 and

```
c="'This is a long string
    that spans multiple lines'"
```

(i)
```
fval= float(s)
type(fval)
```

(ii) bool(s)

(iii) c.count('\n')

(d) Consider a list seq= [1, 2, 0, 4, 6, 5, 2, 1]. Write a code to find the sum of elements of the value till element 5. (2)

(e) Consider the given arr = [1,2,8,9,3,4,7,5,10,6]. What will be the resulting array if these operations are performed arr[2:5], arr[-5: -1] and arr[::2]. (3)

(f) Create a dataframe with four rows and three columns and populate it with random values. Index of the rows are 'Utah', 'Ohio', 'Texas', 'Oregon' and column indexes are 'b', 'd', 'e'. Write a lambda function to compute the difference between the maximum and minimum of each column. (3)

(g) Create an array *num* of size 2×3 filled with all zeros then insert [[1,2,3], [4,5,6]] into array. Identify the shape of the array *num*. (3)

(h) Write a code to read a CSV file with new delimiter as ';' and line terminator as '\n'. (3)

(i) Consider following piece of code and give the output. (3)

P.T.O.

```
import pandas as pd
a = pd.DataFrame({'id': [1, 2, 9, 10],
    'val': ['a', 'b', 'c', 'd']})
b = pd.DataFrame({'id': [1, 7, 10, 12, 13, 7],
    'val': ['p', 'q', 'r', 's', 't', 'u']})
c = pd.merge(a, b, on='id', how='right')
```

(i) How many 'NaN' values are in the dataframe 'c'?

(ii) Drop duplicate values from dataframe 'b' and keep the last duplicated value.

(j) Generate DateTimeIndex of length 20 where each index will be Tuesday of the third week of a month starting from 10-Jan-2022. (3)

(k) Consider dataframe df (4)

```
import pandas as pd
import numpy as np
df = pd.DataFrame({'key': ['a', 'b', 'c'] * 4,
    'value': np.arange(12.0)})
```

What will be the output of the following statements?

(i) Print the dataframe *df*.

(ii) Write a code to group the dataframe using key.

(iii) Multiply each group value by 2.

2. (a) Consider a dataframe df as (6)

```
import pandas as pd
import numpy as np
df = pd.DataFrame({'key1': ['a', 'a', 'b', 'b', 'a'],
    'key2': ['one', 'two', 'one', 'two', 'one'],
    'data1': np.random.randn(5),
    'data2': np.random.randn(5)})
```

Provide the output for the following :

(i) print(df)

(ii)
```
m1 = df['data1'].groupby([df['key1'],
df['key2']]).mean()
print(m1)
```

(iii) m2 = df['data1'].groupby ([df['key1']).mean()

(iv)
```
pieces = dict(list(df.groupby('key1')))
pieces['b']
```

P.T.O.

(v) for(k1,k2),group in

```
df.groupby(['key1','key2']):
    print ((k1, k2))
    print(group)
```

(b) Give output of the following code. Justify.

(i) (2)

```
val=['foo', 2, [4,2]]
val[2] = (5, 4)
print(val)
```

(ii) (2)

```
var=(3, 5, (4,5))
var[1] = 'two'
print(var)
```

3. (a) Given the following list of strings (5)

List1 = ['Amazon', 'Amazing Amazon', 'Apple', 'Microsoft', 'Apple is good for health', 'I like Microsoft'].

Using 'List1', generate the following dictionary 'Anydict' where key is the count of words in a string and value is the list of strings having that

count. Anydict={1:['Amazon', 'Apple', 'Microsoft'], 2: ['Amazing Amazon'], 3: ['I like Microsoft'], 4: ['Apple is good for health']}.

(b) Write a code to read the data from a csv file. Find the number of rows and columns in the data, replace missing values with zero, and remove duplicate values. Write the modified data back to the original file. (5)

4. (a) What is the use of generator function? Write a generator function to print square of first n natural numbers where n is user input. (4)

(b) Write a code program to draw a scatter plot comparing marks of Mathematics= [88, 92, 80, 89, 100, 80, 60, 100, 80, 34] and Science = [35, 79, 79, 48, 100, 88, 32, 45, 20, 30] subjects.

Import the necessary libraries.

Title the plot as 'Marks Comparison' and label y-axis as 'Marks Scored'.

Assign red color to mathematics marks points and blue color to science marks points. (6)

P.T.O.

5. (a) Consider the following data frame Family containing a family name, gender of the family member and her/his monthly income and expenditure in each record.

Name	Gender	Monthly Income	Expenditure
Shahin	Male	114000.00	58000.00
Vimal	Male	65000.00	32000.00
Vimala	Female	69500.00	38500.00
Vimala	Female	155000.00	70000.00
Karan	Male	103000.00	52000.00
Shahin	Male	55000.00	18000.00
Seema	Female	112400.00	60000.00
Seema	Female	81030.00	25000.00
Vimal	Male	71900.00	30000.00

(i) Find correlation between *Monthly Income and Expenditure*. (1)

(ii) Use map function to convert each value of *Name* into uppercase. (2)

(iii) Create a new data frame Info having a hierarchical inaex on columns *Name and Gender*. (2)

(b) Consider the data array = [0.9296, 0.3164, 0.1839, 0.2046, 0.5677, 0.5955, 0.9645, 0.6532, 0.7489, 0.6536] of 10 floating-point values. Write code for following :

(i) Create 5 bins of the array using the cut method. (1)

(ii) Create 5 bins of the array using the qcut method. (1)

(iii) Create 5 bins of the array withprecision = 2 using cut method. Also explain the usage of parameter precision. (3)

6. (a) Consider the following code :

```
import pandas as pd
left = pd.DataFrame({'key1': ['foo', 'foo', 'bar'],
    'key2': ['one', 'two', 'one'], 'lval': [1,2,3]})
right = pd.DataFrame({'key1':['foo', 'foo', 'bar',
    'bar'], 'key2':['one', 'one', 'one', 'two'],
    'rval': [4,5,6,7]})
```

Provide output of the following :

(i) pd.merge (left, right, on=['key1']) (2)

(ii) prop_cumsum=left.sort_values (by='key2', ascending=False).1val.cumsum()
print(prop_cumsum) (2)

(iii) left.append (right) (2)

(b) Consider a data given below :

EMP ID	EMP NAME	SALARY
1	Satish	5000
2	Vani	7500
3	Ramesh	10000
4	Rajesh	8000
5	Virat	9500

Write a code for the following :

(i) Create a dataframe for the above data. (2)

(ii) Print elements of 2^{nd} to 4^{th} column of 3^{rd} to 5^{th} row. (1)

(iii) Print elements of all the columns for first two rows. (1)

7. (a) Consider the code given below :

```
import pandas as pd
from datetime import datetime
dates = [datetime(2011,1,2),datetime(2011,1,5),
        datetime(2011,1,7),datetime(2011,1,8),
        datetime(2011,1,10),datetime(2011,1,12)]
ts = pd.Series(np.random.randn(6), index=dates)
```

Provide output for the following code:

(i) print (ts) (1)

(ii) print(ts + ts[::–1]) (1)

(iii) print (ts.index[0]) (1)

(b) Write a code to convert string of date '2022-10-20' to string of date '20/10/2022'. (3)

(c) Provide output of the following code : (4)

```
rng=pd.date_range('2010-01-01',periods=12,freq='T')
```

P.T.O.

```
ts= pd.Series(np.arange(12), indexing=rng)
print(ts)
print(ts.resample('5min', closed= 'right').sum())
print(ts.resample('5min', closed= 'right', label=
'right', loffeset= '–1s').sum())
print(ts.resample('5min').ohlc())
```

(5)

[This question paper contains 8 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 1193

Unique Paper Code : 32347504

Name of the Paper : Microprocessor

Name of the Course : **B.Sc. (H) Computer Science: DSE**

Semester : V

Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **all** questions from **Section-A**.
3. Attempt any **four** questions from **Section-B**.
4. Attempt all parts of a question together.

SECTION A

1. (a) What is the difference between a program visible and invisible register set? Give examples of at least two program invisible registers. (3)

P.T.O.

(b) What is the difference between 8086 and 8088 microprocessors? (3)

(c) Are the following instructions valid?

(i) PUSH 1234H

(ii) MOV DS, AX

(iii) MOV DS:[BX], 10H (3)

(d) Consider a memory device of 400H. It has base address as 20000H.

(i) What is the size of the memory device in bytes?

(ii) What is the starting address location and ending address location? (3)

(e) Explain the following instructions –

(i) OUTSW

(ii) INSD (3)

(f) Explain direct data addressing mode with the help of an example.

(g) Explain BOUND interrupt instruction. (2)

(h) Assume a memory device with 10 address pins and 8 data pins. What will be the size of the memory device? (3)

(i) Which type of JMP instruction (short, near, or far) assembles for the following : (3)

(i) If the distance is 0160H bytes

(ii) If the distance is 10000H bytes

(j) If direction bit D is 0, DI = 01FFH, SI = 0100H, then what will be the value of SI and DI after execution of MOVSD instruction? Explain. (3)

(k) Explain the following output pins of 8284A clock generator :

(i) CLK

(ii) PCLK

(iii) OSC (3)

(l) Explain the concept of two memory banks in 8086 microprocessor. (3)

SECTION B

2. (a) Consider a memory device, 256K X 8 DRAM.

(i) Specify the number of data pins, address pins, selection pins and control pins of the given memory device.

(ii) Explain diagrammatically how address pins are demultiplexed in the given memory device? (2+3)

(b) Write all five steps that occur when an interrupt is active? (5)

3. (a) Answer the following questions – (2)

(i) What happens in 8086/8088 when TEST input is at logic 1?

(ii) How many address pins are there in a 4K memory device?

(b) Differentiate between NMI pin and INTR pin. (3)

(c) Explain Operation Command Words (OCW1, OCW2, OCW3) of 8259A programmable interrupt controller (PIC). (5)

4. (a) Describe protected mode of memory. If DS = 110FH, then which descriptor table entry is accessed and what will be the privilege levels? (5)

(b) Explain the following assembly language instructions with example :

(i) CWD

(ii) DAA (5)

5. (a) Suppose EAX = 00000200, EBX = 00000250, DS = 0300H, SS = 0440H, BP = 0110H and SI = 0010H. (5)

Determine the address accessed by each of the following instructions, assuming real mode operation :

(i) MOV ECX, [BP – 200H]

(ii) MOV DL, [BP + SI – 10H]

(iii) MOV BX, [SI + 100H]

(iv) MOV ECX, [EAX + 2*EBX + 10]

(v) MOV [EAX + 4*EBX], AL

(b) (i) What is the difference between far and near CALL?

(ii) Explain about the interrupt INTO. (3+2)

6. (a) Explain the function of following pins of 8086 microprocessor –

(i) LOCK

(ii) HOLD

(iii) ALE

(iv) Status pins S3, S4

(5)

(b) Explain the mode register of 8237 DMA Controller.

(3)

(c) Explain Branch Prediction Logic of Pentium microprocessor.

(2)

7. (a) Write arithmetic and logical assembly instructions for the following :

(i) SUBTRACT DI from SI

(ii) OR 88H with ECX

(iii) AND BX with DX and save the result in BX

(iv) XOR BH with AH and save the result in AH

(v) ADD the data addressed by SI to AL

(5)

(b) Explain the strobed-input operation of Programmable Peripheral Interface 82C55 with help of a diagram.

(5)