Sr. No. of Question Paper: Roll No…….

Unique Paper Code	: 32341102
Name of the Course	: B.Sc. (Hons.) Computer Science
Name of the Paper	: Computer System Architecture (ER)
Semester	: I
Duration	: 3 Hours
Maximum Marks	: 75
Year of Admission	: 2017-2018/2019-2020

Instructions for Candidates:

1. Write your Roll No, on the top immediately on receipt of this question paper.
2. Attempt any four questions out of six

Q1. Represent the numbers (-99) and (-64) in binary form using following three representations- signed representation, one's complement representation and two's complement representation. Use 8-bit register to perform following arithmetic operations in binary form using signed 2's complement representation for negative numbers.

+99	-99	-99
-64	+64	-64
-----	-----	-----
-----	-----	-----

Identify in which of the above cases the overflow occurs and why? Justify your answer. How is the overflow detected?

Q2. Write an assembly language program to evaluate the arithmetic statement X using the following instruction formats:

(a) General register computer with three address instructions
(b) General register computer with two address instructions

$$X = \frac{(N \times O - M) + L}{M + N}$$

Use the symbols ADD, SUB, MUL and DIV for arithmetic operations; MOV for the transfer-type operation; and LOAD and STORE for transfers to and from AC register and memory. Assume that memory operands are stored at memory addresses L, M, N, O and the result must be stored in memory at address X.

Q3. For the Boolean function ***F*** and the don't care conditions ***d***, perform the operations that follow:

$F(I, J, K, L) = \sum (1,2,5,7,9,11)$

$d(I, J, K, L) = \sum (3,4,6,8,10)$

a) Find the Sum-of-Products form F_s using a Karnaugh map
b) Find the Product-of-sums form F_p using a Karnaugh map
c) Draw the logic diagram for F_p, the reduced POS expression.
d) Show that $F_s \cdot F_s' = 0$ and $F_s + F_s' = 1$ for the reduced SOP expression

Q4. (a) A computer uses a memory unit with 128 K words of 32 bits each. A binary instruction code is stored in one word of memory. The instruction has 4 parts: an indirect bit, an operation code, a register code part to specify one of 16 registers and an address part.

- How many bits are there in the operation code, the register code part and address part?
- Draw the instruction word format and indicate the number of bits in each part.
- How many bits are there in the data inputs of the memory?

(b) Convert the following number with the given radix to decimal and then to binary.

i. $3B89_{14}$
ii. 9654_{9}

(c) Draw a space-time diagram for a five-segment pipeline showing the time to process seven tasks.

(4+1=6)

Q5. (a) Specify the 14-bit binary control words that must be specified to the processor in terms of SELA, SELB, SELD and OPR to implement following micro-operations:

$$R7 \leftarrow R1 + R5$$
$$R5 \leftarrow R3 - R4$$
$$R7 \leftarrow R7$$
$$R3 \leftarrow \overline{R3}$$
$$R1 \leftarrow (R1 + 1)$$

where the three bit binary code for selecting the register corresponds to the register numbers and binary code of OPR for various operations are given in the following table:

Symbol	Binary value of OPR
Add	00010
Subtract	00101
Complement	01110
Increment	00001
Decrement	00110

(b) Draw the block diagram for the hardware that implements the following statements:

$$x'y + z: AR \leftarrow AR - BR$$

Where AR and BR are two n-bit registers and x, y and z are control variables. Include the logic gates for the control functions (Remember that the symbol '+' designates an OR operation in a control or Boolean function)

Q6. (a) How many flip-flops will be complemented in a 12-bit binary counter to reach the next count after:

I. 110001100111

II. 111101101011

III. 100001111111

IV. 100001111001

(b) An instruction is stored at location 400 with its address field at location 401. The address field has the value 900. The location 900 contains the value 875. A processor register R1 contains the number 200. Draw a block diagram of memory showing the contents at above locations. Evaluate the effective address (EA) if the addressing mode of the instruction is:

I. Direct
II. Relative
III. Immediate
IV. Indirect
V. Register Indirect

This question paper contains 3 printed pages.

Roll No._____

Unique Paper Code	**32341101_OC**
Name/Title of the paper	**Programming Fundamentals using C++**
Name of the Course	**B. Sc. (H) Computer Science**
Semester	**I**
Year of Admissions	**2017, 2018**
Duration of Examination	**3 Hours**
Maximum Marks	**75**

Instructions for Candidates

1. Attempt any FOUR out of SIX questions. All questions carry equal marks

2. State the assumptions taken, if any, in your answers. The data types of variables/data members/arrays and return types of the functions/member functions should be assumed suitably unless explicitly mentioned.

Q1 Write a program in C++ that creates a base class **`CentreTable.`** Use this class to store two **`double`** type values that is used to compute area of figures. The class also comprises the following members:

i. Default and parameterized constructors, height of all centretables is 1 metre.

ii. An inline member function **`printData()`** that prints the details of an object of the class.

iii. Derive classes called **`rectcentretable, tricentretable and circentretable`** from the base class **`Centretable,`** which have tops of the shape rectangle, triangle and circle respectively**.**

iv. Add member functions **`centretablearea()`**and **`displayarea()`**to the above classes to compute the area of the top of the centretable and display it.

Write a program that will accept dimensions interactively and display the area.

Q2. Write a C++ program **`SALES`** to calculate weekly and monthly average sales for a district. Use a two-dimensional **`double`** array to store six values representing sales for each week (Monday to Saturday). Write a function to calculate and print the following:

i. **`weeklyaverage()`** of sales.
ii. **`monthlyaverage()`**of sales.

Q3 Write a program that emulates the **`DOS COPY`** command which copies the contents of a text file (such as any .CPP file) to another file. Invoke the program with two command-line arguments - the source file and the destination file - like this:

```
C>ocopy srcfile.cpp destfile.cpp
```

Check the number of arguments and access permission to files.
Write a function that prompts the user to enter the **`first name, middle, last name, and employee number`** of type **`unsigned long.`** Using formatted I/O with the i**`nsertion (<<)`** operator copy the input to an **`ofstream`** object. Terminate the strings with a space or other whitespace character.
Close the **`ofstream`** object when user has completed the input
Open an **`ifstream`** object to read and display all the data in the file, and terminate the program.

Q4. Write a menu driven program in C++ which accepts four integer operands **a, b c** and **d** and operators **(+, -, *, /)** to implement operator overloading and displays the result:

i. **Addition: a/b + c/d = (a*d + b*c) / (b*d)**
ii. **Subtraction: a/b - c/d = (a*d - b*c) / (b*d)**
iii. **Multiplication: a/b * c/d = (a*c) / (b*d)**
iv. **Division: a/b / c/d = (a*d) / (b*c)**

Q5 Implement the following functions in C++ :-

i) **printSumTerm()**: The function accepts value of a positive integer **n** as input and returns the **nth** term of the following series:

$$\left(1+\frac{1^0}{0!}\right)+\left(2+\frac{1^1}{1!}\right)+\left(3+\frac{1^2}{2!}\right)+\left(4+\frac{1^3}{3!}\right)+\left(5+\frac{1^4}{4!}\right)+\cdots\ldots.\left(n+\frac{1^{(n-1)}}{(n-1)!}\right)$$

ii) **Odd_sentence_Case()**: The function that accepts a reference to a string and Capitalize the first letter of every word occurring in the odd position in the given string.

iii) **Count_even_Lower()**: The function accepts a string and returns the count of lowercase letters occurring at the even position in the given string.

Q6. Define a class **Airline** with the following data members and member functions

i. Data Members: - **Airline number, Boarding time, Airline cost**
ii. Define a parameterized constructor and a copy constructor to initialize its data members. The parameterized constructor function should accept the **Airline number, Boarding time** and **Airline cost** as input parameters.
iii. Define a member function **void print()** to display the objects of the class **Airline.**

This question paper contains 4 printed pages

Rollno._____

Unique Paper Code : 32341101

Name/Title of the paper : Programming Fundamentals using C++

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

Semester : I

Year of Admission : 2019 onwards

Duration : 3 Hours

Maximum Marks : 75

Instructions for Candidates

1. Attempt any FOUR out of SIX questions.

2. All questions carry equal marks.

Q1 Write a program in C++ that defines a class named **`List.`** The data members of this class are as follows:

- An integer array **`Arr`** of size 20.
- Index **`s1`** of type integer.

Define member functions in **`List`** as given below:

- parameterless and parametric constructor that initializes the elements of the array **`Arr`** and index **`s1`** to zero.

- **`void input()`**: This function asks the user for the number of elements that will be stored in the array **`Arr`**. The value entered by the user is stored in **`s1`**. Next it asks the user for **`s1`** values and stores the values entered by the user in the array **`Arr`**.

- **`void insert(int x)`**: This function will insert the value **`x`** at the end of the Array **`Arr`** if **`Arr`** is not full, else the function will print the message **`"List is Full"`**.

- **`void countduplicate():`** This function will count and display the number of duplicate elements in the array **`Arr`**.

- **`void search(int x) :`** This function will search for an element **`x`** in the array **`Arr`**. If the element is found then the function will display its position else it will print the message **`"Element not found"`**.

- **`void display ():`** This function will display the elements stored in the array **`Arr`**.

Q2 Write a program in C++ that defines a 2D array **`A`** of characters. The array has a size **`m*n`** where **`m`** is the number of rows and **`n`** is the number of columns. **`m`** and **`n`** should be declared as constants. Define the functions with the following prototypes in the program.

- **`void read(char A[][n], int m1):`** This function will read an array of **`m1`** strings and stores them in the array **`A`** .

- **`void countvowels(char A[][n],int m1):`** This function will display the count of vowels in the array **`A`** .

- **`int find(char A[][n],int m1, char b[n]):`** This function will search a string **`b`** in the array **`A`** . It will return 1 if the string **`b`** is found in the array **`A`** else it returns 0.

- **`void display(char A[][n], int m1 ):`** This function will display the array of strings **`A`**.

Q3 Write a program in C++ that reads text from the keyboard till the end of character is entered. The text is stored in the file named **`"File1.txt".`**

For each of the specified prototypes given below, write the function definition.

- **`void read(ofstream& fp ):`** This function reads the text entered through the keyboard and stores the text in the file named **`"File1.txt".`**

- **`void copy(ifstream& fp, ofstream& fp1):`** This function reads the content of the file **`"File1.txt"`** and copies this content without newline to the file named**`"File2.txt"`**.

- **`void print(ifstream& fp):`** This function displays the content of a given file using **`fp`**.

- **`void countlength(ifstream& fp):`** This function will read the content of a file and display the number of characters in the file.

- **`void contentcheck(ifstream& fp1,ifstream& fp2):`** This function reads two files **`"File1.txt"`** and **`"File3.txt"`** and compares the content of these files

character by character. The function should print the message **"Both Files have the same content"** if the content of both the files matches exactly. If the content does not match then it should display the message **"Content of the files is not same"**. Use Exception handling to deal with any errors that arise during file operations in the **contentcheck** function.

Q4 Write a program in C++ that defines a class named **Point** that represents a three-dimensional point **(x, y, z)**. This class declares variables **x, y** and **z** of the integer data type. The member functions of this class should be defined as given below.

- parametric and copy constructor for initializing the data members **x,y** and **z** of the class **Point**.
- Define a function using operator overloading to change the sign of the data members **x,y** and **z**.
- Overload Operator **<<** as a friend function in the class for displaying the object of this class.
- Write a function for converting the object of the class **Point** to its integer equivalent.
- Overload the subscript operator **[]** for the class **Point** such that object **o1** of this class return **x** for **o1**[1], **y** for **o1**[2] and **z** for **o1**[3].

Q5 Define a class **Employee** with data members – **Name, Organization, Qualification** and **Salary**. In this class define member functions as given below:

- parameterless constructor to initialize the data members - **Name**, **Organization**, **Qualification** and **Salary**.
- A function **disp()** for displaying the **Name**, **Organization**, **Qualification** and **Salary**.
- A pure virtual function void **print()**.

Derive the class **Faculty** from the **Employee** class using public inheritance. In the **Faculty** class declare data members: **Course** and **Workload**(number of working hours of a faculty in a week) of the appropriate data type and define a parametric constructor for initializing these data members. Override the **print()** function in **Faculty class** to display the **Course** and **Workload.**

Derive a class **Staff** from the **Employee** class using public inheritance. This derived class declares data members -**Designation** and **Job_Description** of the appropriate data type. Define the parametric constructor of this class to initialize the values of **Designation** and

Job_Description. Override the **print** function in this class to display **Designation** and **Job_Description.**

Define the **main()** function and declare one object each of **Faculty** class and **Staff** class. Use run time polymorphism and display the details of **Faculty** and **Staff** class objects.

Q6 Write the C++ statements for the following tasks:

- Write a prototype for the function named **fread()** that accepts two parameters: pointer to a constant character and a float variable. The return type of this function is void.
- Use ternary operator to find the maximum of three numbers **x,y** and **z** and store the maximum value in the variable **u.**
- Write a statement that extracts a substring of length 4 from the beginning of the string **s1**= "Programming".
- Write a statement to initialize a float array **arr1** with any four real literals at the time of declaration.
- Define a class **X** that declares a static data member **n** of type integer. Write the statement for initializing the value of static data member **n** as zero.

Unique Paper Code	**: 32341102_OC**	
Name of the Course	**: B.Sc. (H) Computer Science**	
Name of the Paper	**: Computer System Architecture**	
Semester	**: I**	
Duration	**: 3 Hours**	**Maximum Marks: 75**

Instructions for the Candidates

Attempt Any Four Questions. All Questions Carry Equal Marks

Q1.
Given the Boolean function $F = x'y + xyz' + xyz$

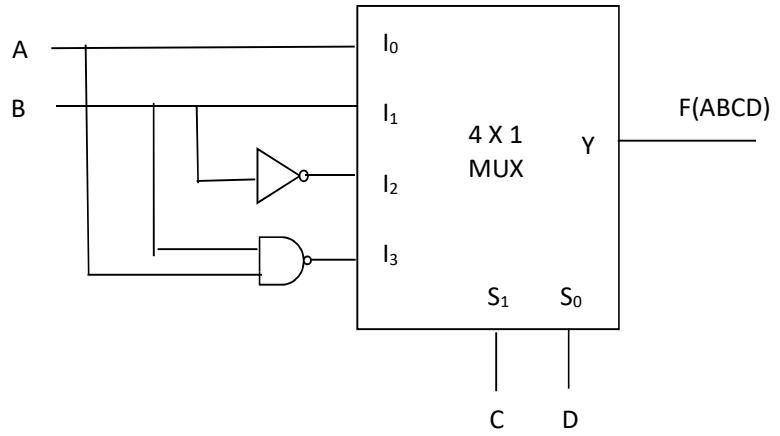
- List the truth table of the function F.
- Draw the logic diagram with NAND gates only.
- Simplify the algebraic expression using Boolean algebra.
- Find complement of the optimized expression F using De-Morgan's Law.

Simplify the Boolean function $f(w,x,y,z) = \sum(0,1,2,3,4,5,8,10)$ with don't care conditions $d(w,x,y,z) = \sum(5,6,11,15)$ using Karnaugh map in

- Sum-of-Products form
- Product-of-Sums form

Q2.
Perform the following operations:

- How many address lines and input-output data lines are needed in $64G \times 32$?
- How many 256×16 memory chips are needed to provide a memory capacity of 8192×32?
- Write the boolean expression for the function F(ABCD) explained by logic circuit shown below.



- Design a combinational circuit with three inputs x, y, z and three outputs A, B, C. The output generates the 1's complement of the input binary number. For example, if input bits are xyz =110, then output bits are ABC =001. Obtain the truth table for all possible combinations of 3-bits. Draw the logic diagram corresponding to each output.
- Represent the hexadecimal number 4F6B2D into binary and octal forms.
- Give decimal representation of $(7982)_{12}$.
- Add two BCD numbers 3456.34 and 0978.45.
- Subtract $(5645)_8$ from $(7056)_8$.

Q3.
Explain briefly what will happen when the following micro instructions are executed:

- $IR \leftarrow M[AR], PC \leftarrow PC + 1$

- $M[AR] \leftarrow PC, PC \leftarrow AR + 1$

Table1 shows the symbolic description of register reference instructions with operation code. The initial value of PC is 025. The content of AC in the basic computer is hexadecimal A789 and the initial value of E is 0.

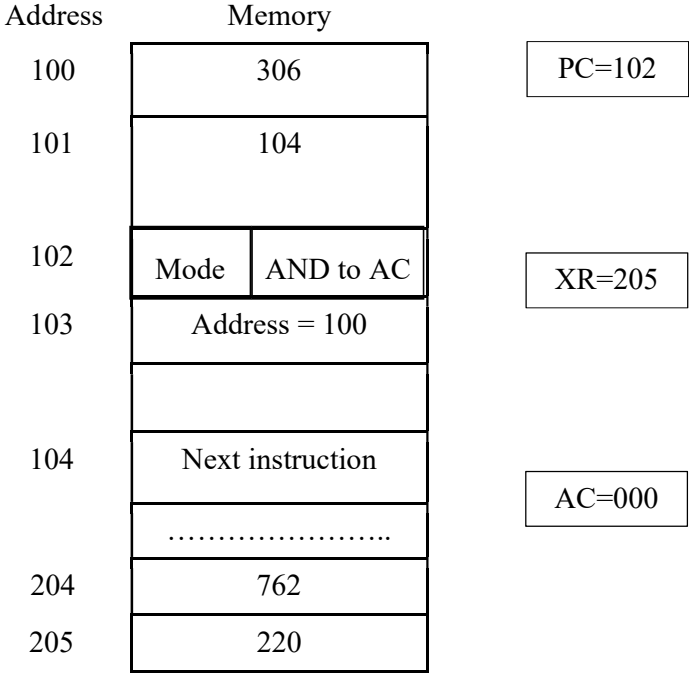
Table 1. Register-reference Instructions

Symbol	Operation Code	Symbolic Description
CLA	7800	$\mathrm{AC} \leftarrow 0$
CMA	7200	$\mathrm{AC} \leftarrow \overline{\mathrm{AC}}$
CIR	7080	$\mathrm{AC} \leftarrow \mathrm{shr\ AC}, \mathrm{AC}(15) \leftarrow \mathrm{E}, \mathrm{E} \leftarrow \mathrm{AC}(0)$
SPA	7010	$\mathrm{IF}(\mathrm{AC}(15) = 0)\ \mathrm{then\ PC} = \mathrm{PC} + 1$
SZA	7004	$\mathrm{IF}(\mathrm{AC} = 0)\ \mathrm{then\ PC} = \mathrm{PC} + 1$
SZE	7002	$\mathrm{IF}(\mathrm{E} = 0)\ \mathrm{then\ PC} = \mathrm{PC} + 1$

Determine the contents of AC, E, PC, AR, and IR in hexadecimal after the execution of the CLA instruction using given operation code (see Table 1). Repeat the same procedure starting with an operation code (see Table 1) of another register-reference instructions: CMA, CIR, SPA, SZA and SZE.

Q4.
Write a program to evaluate the arithmetic expression $X = (A - B * C)/(D + E)$ using two address instructions.

Consider the following snapshot of memory to answer the following questions.



	……..
305	103
306	101

A two-word instruction "AND to AC" being currently executed is stored at location 102 with its address field at location 103. The program counter PC has the value 102 for fetching the instruction. The Accumulator register AC receives the operand after the instruction is executed. An index register XR contains the value 205. Evaluate the effective address and content of AC if the addressing mode of the instruction is:

- Direct
- Immediate
- Indirect
- Relative
- Indexed addressing mode with XR as the index register.

According to general register organizaton of a computer, a 14-bit binary control word consists of three fields SELA, SELB, SELD of 3 bits each, for selecting registers and operation OPR. Specify the control word that must be applied to the processor to implement the following microoperations using Table 2.

- $R2 \leftarrow R1 + R3$
- $R4 \leftarrow R2 \wedge R3$
- $R5 \leftarrow shr\ R5$

Table 2. Encoding of ALU operations

OPR Select	**Operation**
00010	ADD
01000	AND
10000	SHRA

Q5.
A computer uses a memory unit with 1024 words of 32 bits each. One word of memory is used to store a binary instruction code and each instruction has four parts: an indirect bit, an operation code, a register code part to specify one of 30 registers, and an address part.

- How many bits are there in the operation code, the register code and the address part?
- Draw the instruction word format and indicate the number of bits in each part.
- How many bits are there in the data and address inputs of the memory?

Consider a four-segment pipeline to perform the following operations:

- Draw a space-time diagram showing the time it takes to process nine tasks.
- Determine the number of clock cycles that it takes to process 990 tasks.
- A task is processed in a non-pipeline system takes 45ns and the same task can be processed in a pipeline system with a cycle of 15ns. Determine the speedup ratio of the pipeline for 220 tasks.
- What is the maximum speedup that can be achieved?

Q6.
In a DMA controller:

- Why are the read and write control lines bidirectional?

- Under what condition and for what purpose are they used as inputs?
- Under what condition and for what purpose are they used as outputs?

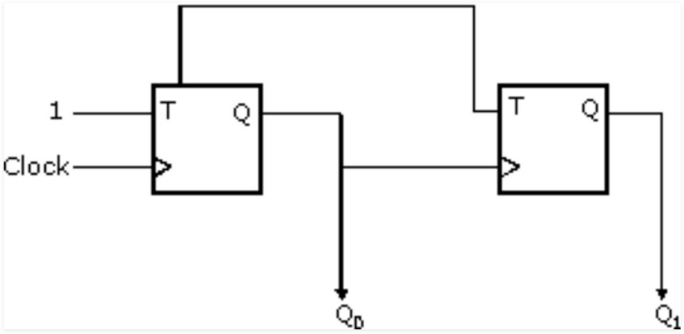
How isolated I/O is different from memory-mapped I/O?

List the advantages and disadvantages of isolated I/O.

Give the excitation table for a flip flop XY whose characteristic table is given as follows:

X	Y	Q(t+1)
0	0	Q(t)
0	1	0
1	0	1
1	1	?

In the sequential circuit shown below, if the initial value of the output Q_0Q_1 is 11, what are the next four values of Q_0Q_1 ?



Unique Paper Code : **32341303_OC**

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

Name of the Paper : **Computer Networks**

Semester : **III**

Year of Admission : **2015-2018**

Duration: **3 Hours** **Maximum Marks: 75**

Attempt any **four** questions.
All questions carry equal marks.

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1 The network **150.13.12.30** has been subdivided into 4 subnets.

(i) Which class the given IP address belongs to?

(ii) Write the subnet mask for the given IP address.

(iii) Give the IP addresses of these 4 subnets.

(iv) How many hosts can be on each subnet?

(v) Determine the starting IP address and the last IP address of each subnet.

(vi) Determine which sub-network the IP address**150.13.12.30** belongs to?

(vii) Determine the limited broadcast address for each subnet.

2 Explain **CSMA protocols** by highlighting their advantages and disadvantages. Consider a situation where two nodes A and B transmit at the same time and the signal takes 1 hour to go from A to B. When will A and B receive the collision signal? What should be minimum length of the packets to be transmitted?

Show the working of **Binary Exponential Backoff algorithm** for the given situation. Assume that X and Y are the only two stations on the Ethernet with each having a long queue of frames to be transmitted. Both X and Y attempts to transmit a frame at the same time, and collide, next X wins the first Back-off race. At the end of this successful transmission by X, both X and Y attempt to transmit their frames again and collide again. Show all thepossible cases.

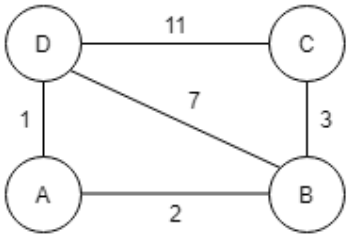
3 A **TCP** machine is sending full windows of 65535 bytes over a 10 Giga bits per second channel that has a 20 msec one way delay. What is the maximum throughput achievable? What is the line efficiency? Which transport layer protocols are used for real time multimedia, file transfer, DNS, and email? Whether HTTP, TELNET, DNS, SMTP uses **UDP** as the transport protocol. Justify your answer.

4 Draw the pulse diagram for the bit stream **011001010011000**average signal ratefor the following line codingschemes:

- **i. Manchester**
- **ii. Differential Manchester**
- **iii. Polar Return to Zero**
- **iv. Polar Non Return to Zero - Level**
- **v. Polar Non Return to Zero – Inversion**

Explain the problems associated with Polar **NRZ** techniques.

5 Consider a network consisting of 4 routers, the weights are mentioned on the edges. The weightmetric is the distance between two nodes. Calculate the new routing table of each router after first exchange. The initial routing table of each router is given below:



A's Initial Routing Table

Destination	Distance	Next Hop
A	0	A
B	2	B
C	∞	–
D	1	D

B's Initial Routing Table

Destination	Distance	Next Hop
A	2	A
B	0	B
C	3	C
D	7	D

C's Initial Routing Table

Destination	Distance	Next Hop
A	∞	–
B	3	B
C	0	C
D	11	D

D's Initial Routing Table

Destination	Distance	Next Hop
A	1	A
B	7	B
C	11	C
D	0	D

6 An analog signal has a bit rate of 16000 bps and a baud rate of 4000 baud. How many data elements are carried by each signal element? How many signal elements do we need?

Out of given techniques **ASK**, **FSK**, **PSK** and **QAM**, whichhas the least noise immunity? Give relevant justification for your answer.

What is the number of bits per baud required for the following techniques:

i. ASK with four different amplitudes

ii. FSK with 8 different frequencies

iii. PSK with four different phases

iv. QAM with a constellation of 128 points.

Also draw the constellation diagram for 8-QAM with two different peak amplitude values, 1 and 3, and four different phases.

Unique Paper Code	**:**	**32341301_OC**
Name of the Course	**:**	**B. Sc. (Hons.) Computer Science – CBCS (Old Course)**
Name of the Paper	**:**	**Data Structures**
Semester	**:**	**III**
Year of Admission	**:**	**2017, 2018**
Duration	**:**	**3 Hours**
Maximum Marks	**:**	**75**

Instructions for Candidates

Attempt Any Four questions. All questions carry equal marks.

1. A theatre has a capacity of *500* seats arranged in *50* rows and *10* seats per row. However, due to the prevailing conditions, very few customers turn up for watching the show. The theatre needs to devise an efficient data structure to store the details of the booked tickets to optimise the memory requirement. Suggest an appropriate data structure to store the details of the booked tickets. Justify the chosen data structure and give the complete class definition for the same. Also, give the code for the following functions in the class definition:
    a. function to add the details of a new booking (single seat),
    b. function to reserve multiple seats in one booking,
    c. function to print the availability of a given seat,
    d. function to display the booked seats,
    e. function for the cancellation of a booked ticket.

2. a) A college has made two sections of BSc. (Hons.) Computer Science I year and arranged the student names of each section in a singly linked list in the lexicographical order. However, in the II year, the two sections should be combined into one section and hence, the lists of student names should also be combined into one single list of names in lexicographic order. Give an efficient algorithm to do the same.

    If the college had used doubly linked lists to store the student names of each section in the lexicographic order, would combining the two lists into one list be more time efficient than using the singly linked lists for the same? Justify the answer.

    Now, one of the students decides to withdraw the admission. A pointer to the node containing the details of that student is given. Would the choice between a singly and a doubly linked list to store the list of names impact the time complexity of this operation? Justify the answer.

b) Explain the working of the given function *f*. Trace and explain the output on the given linked list, when the function is invoked as *f(head,0,0)*, such that *head* is pointing to 12.

Linked List - 12->14->61->18->5->13->10->17

```
void f (Node* n, int x1, int x2)
{
   if (n == NULL)
   {
        cout<<x1<<endl<<x2;
        return;
   }

   if(n-> data % 2 == 0)
   {
        x1++;
        f(n-> next, x1, x2);

   }


   else
   {
        x2++;
        f(n-> next, x1, x2);
    }
}
```

3. a) Given '*n'* temperature readings for a day, write an algorithm to find the duplicate temperature readings in the entire day. Also, show the sample run of your algorithm on the following temperature readings 38, 39, 40, 41, 42, 40, 39, 37.

b) Evaluate the following postfix expression using stack. Show the stack after each step.

CAB+-DBC+ - * where A=1, B=2, C=3, D=4

4. a) A lottery game generates *100* tickets each having a *10*-digit ticket number. These *100* tickets are to be hashed into a square matrix (10X10) based on the ticket number. The summation of the first five digits of a ticket number (modulo the number of rows in the square matrix) is used to identify the row number and the summation of last five digits of the ticket number (modulo the number of columns in the square matrix) is used to identify the column number of the square matrix to store that particular ticket. Two tickets may hash to the same location in the square matrix, in which case, the location becomes a bucket that can hold multiple tickets. Demonstrate the working of the above game on the following ticket numbers:

   1234567890, 0123456789, 0234516789, 0134526789, 0124536789, 0123546789, 0123465789, 9012345678

   What restrictions, if added in the ticket generation code, can reduce the chances of collision? Justify the answer.

   b) A memory block can store maximum *4* values and minimum *2* values in the ascending order and gives way to *5* more such blocks for creating hierarchical data storage. However, the top block of this hierarchical data storage is allowed to have minimum *1* value and maximum *4* values. Considering these restrictions, store the following elements in a B tree. Show the data structure after each insertion.

   <57, 72, 32, 14, 19, 22, 10, 30, 25, 7>

   Then, delete values “14” and “10” one by one. Show the data structure after each deletion.

5. Construct a binary search tree for the following keys 100, 50, 20, 30, 25, 58, 75, 64. Show all the steps and the resulting BST after each step. Thereafter, all the keys are to be deleted one by one sequentially, such that the root node is deleted every time. Show all the steps while deleting each node. Use deletion by copy method to delete a node with two children.

6. An event management team has to organise a prize distribution ceremony for a college. A pile of *100* books is placed on a table. These books, starting from the topmost book, are to be awarded to the students as they arrive on the ceremony stage. The student who arrives first gets the book first. Suggest the suitable data structures that should be used to maintain the pile of books and the list of students to be rewarded. Give the complete class definition with the necessary data members, constructors for implementing this scenario with function definitions to pick a book from the table and presenting it to the arriving student, adding *100* books originally to the pile and *100* students in the list of rewarded students.

Unique Paper Code: 32341301

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

Name of the paper: Data Structures

Semester: III

Year of admission: 2019

Duration: 3 Hours Maximum Marks: 75

Instructions for Candidate

Attempt any four questions. All questions carry equal marks.

Q 1	Write a program to implement a ticket reservation system for a particular flight. The program should display a menu with the following options: 1. reserve a ticket. 2. cancel a reservation. 3. check whether a ticket is reserved for a particular person. 4. display the passenger list. Use singly linked list for storing information. Information is maintained in ascending order of names. Is there any disadvantage if information is not kept in a sorted way?
Q 2	a) Consider the intermediate configurations of an array being sorted. Which sorting algorithm is being used in each case? Justify your answer. (i) (10, 3, 14, 9, 8) (3, 10, 14, 9, 8) (3, 8, 14, 9, 10) (3, 8, 9, 14, 10), (3, 8, 9, 10, 14) (ii) (50 , 3, 20, 40, 10,) (3, 20, 40, 10, 50) (3, 20, 10, 40, 50) (3, 10, 20, 40, 50), (3, 10, 20, 40, 50)

b) Consider an n X n matrix A where

$$A[i,j] = 0 \text{ if } (i+j-n) \neq 0,1,2 \quad 1 \leq i, j \leq n$$

The non-zero elements of this matrix ie. the element A[i,j] where i+j-n >=0 and i+j-n<=2 , are stored in a single dimensional array. What will be the size of this 1-dimensional array B? How the elements of A are stored in B. Write the formula for accessing (i,j) th element of A?

The following 5X5 matrix of the above type is given. Store this a single dimensional array B using the above scheme. Calculate the address of A[3,3] if the base address of array B is 200.

0	0	0	10	20
0	0	5	6	9
0	11	25	29	0
30	90	12	0	0
52	19	0	0	0

Question 3

a) Shyam wants to evaluate the following expression. He doesn't know maths, so he seeks help from his friend Ram. Ram doesn't know how to evaluate infix expressions but he is an expert in solving postfix expressions. Help Ram by converting the following infix expression to postfix expression.

2 + (((30 - 10)*(10 -5) + 15) / 5) * (10 - 5)

Show the status of the stack at each step.

Also evaluate the above postfix expression using stack. Show the status of the stack at each step.

	b) What does the following function compute? *int function (int *array, int size)* *{* *int temp = 0;* *for (int i=0 ; i<size ; i++)* *temp += array[i];* *return temp;* *}* Write a recursive function that performs the same operation as performed by the function given above.Which data structure is used to implement recursion? Explain how recursion works with the help of the recursive function written above and an array containing the values 2, 6, 3, 4, 5, 9, 1.
Question 4	Suppose there is a circle. There are *n* petrol pumps on that circle. You are given two sets of data. 1. The amount of petrol that every petrol pump has. 2. Distance from that petrol pump to the next petrol pump. Calculate the first point from where a truck will be able to complete the circle (The truck will stop at each petrol pump and it has infinite capacity). Expected time complexity is O(n). Assume for 1-litre petrol, the truck can go 1 unit of distance. Suggest the appropriate data structure and give the implementation of the above function to calculate the first point. Further, trace your function on the given following data: 6 petrol pumps with amount of petrol and distance to next petrol pump are {3,5}, {6,7}, {4,1}, {2,6}, {8,3}, {4,5}
Question 5	a) An operating system uses the Non-Preemptive Priority scheduling (NPPS) algorithm to schedule processes, wherein, each process is assigned a priority. Process with the highest priority (priority 1 is highest priority) is to be executed first and so on. Ties are broken arbitrarily. For the NPPS scheduling algorithm, which of the following data structures:- linked list, binary search tree, Binary-Heap; is/are suitable

	to add a process in O(log n) time and schedule a process in O(log n) time. Justify your answer. For **the chosen** data structure show its contents as processes are added and scheduled as per the given sequence. (show results after each step) -Add process P1 (Priority 8) -Add process P2 (priority 4) -Add process P3 (priority 3) -Add process P4 (priority 5) -Add process P5 (priority 1) -Add process P6 (priority 6) -Retrieve a process for scheduling -Retrieve a process for scheduling b) In an empty B-tree of order 3 insert the following keys <10, 20, 30 ,40 , 50, 5, 15, 25, 1, 2, 7>. Show the B-tree diagrammatically after each key insertion. Next delete the key 40 from the constructed B-Tree.
Question 6	a) Reena wants to send a text file over the network. Before sending the file she wants to encode it using some algorithm which needs the frequency of all the letters in the file. Help Reena to find the frequency of each letter using an AVL tree. i) Give the structure of the node of the AVL tree. ii) You are given the sample file, draw an AVL tree for the same and print all the letters in alphabetical order along with their frequencies **<u>Sample File</u>** **so i said yes to thomas** iii) Argue that the time complexity of finding the frequency of letters in a text file is linear.(2 + 8 + 3)

	b) Specify which searching technique out of linear search and binary search needs a sorted array as input? What is its running time? Does Hashing guarantee search in O(1) running time? For a Hash table of size 11 that uses open addressing for collision resolution, h(k) = k modulo 11. Construct a sequence of 10 keys to be inserted into an empty hash table one by one such that for each of the first 5 keys there is no collision and for each of the last 5 keys there is at least one collision.

This Question Paper contains 3 page(s)

Unique Paper Code	: 32341302_OC
Name of the Course	: B.Sc. (H) Computer Science CBCS
Name of the Paper	: Operating System
Semester	: III
Duration	: 3 hours
Maximum Marks	: 75
Year of Admission	: 2017 & 2018

Attempt any four questions. All Questions carry equal marks.

Q 1. Consider a paging system with the page table stored in memory. If a paged memory reference takes 300 nanoseconds, how long does a memory reference take and give justification for your answer? Now if we add associative registers, and we have an effective access time of 200 nanoseconds, what is the hit-ratio? Assuming access to the associative register takes 10 nanoseconds.

Now consider the following segment table:

Segment	Base	Length
0	19	40
1	100	44
2	190	100
3	320	280
4	1052	196
5	200	38

What are the physical addresses for the following logical addresses and give explanation for the same.
(1,30), (2,29), (3,340), (4,250),(5,40),(0,44)

Assuming a 1-KB page size, what are the page numbers and offsets for the following address references (provided as decimal numbers): 1250, 5300, and 2500. Show calculation at each step.

Q 2. A system has 3 processes P1, P2 and P3, and 3 resources R1, R2 and R3. There are instances each of R1 and R2, and one instance of R3. Given the edge set

E = {R1 → P1, R2 → P2, P1 → R3, R1 → P2, P3 → R1, R2 → P3, R3 → P3}.

Draw the resource allocation graph. Is the system in a deadlock? If the answer is yes, then mention the processes in the deadlock else identify the sequence in which the processes can execute.

Now consider the following program code and find how many processes are there in the system at line 4 and line 8? Justify your answer

```
Line 1:   #include <stdio.h>
Line 2:   #include <unistd.h>
Line 3:   void main()
Line 4:   {
Line 5:       int i;
Line 6:       for (i= 0; i<4; i++)
Line 7:           fork();
Line 8:   }
```

A program has just read the first record. The program wants to read the eighth record next, how many records must the program read using (i) Direct Access and (ii) Sequential Access methods? Explain your answer.

Q 3. Consider the following memory address references:

123, 124, 167, 273, 278, 732, 42, 1478, 1420, 324, 368, 841, 974

What will be the reference string corresponding to the addresses given above (assuming page size is of 100 bytes)? And how many page faults will occur using FIFO and LRU page replacement algorithms with this reference string assuming that the process can have only three free frames?

Also suppose there is a system with 200 KB of memory with no memory initially allocated. Given the following sequence of requests by the processes, show the memory layout at every stage for first-fit and best-fit allocation algorithms.

Process Number	**Nature of Request**	**Amount of memory requested (in KB)**
P0	Allocation	20
P1	Allocation	30
P2	Allocation	40
P3	Allocation	40
P0	Deallocation	
P3	Deallocation	
P4	Allocation	40
P5	Allocation	10

If the total number of frames in main memory is 100 and there are 5 processes in the system with the demand as 24, 76, 50, 10 and 40 frames, respectively. What will be the number of frames allocated using the equal and proportional allocation strategies?

Q 4. Consider the following set of processes, with the length of the CPU burst times given in milliseconds:

Processes	Burst Time	Priority	Arrival Time
P0	7	3	0
P1	10	4	1
P2	8	3	2
P3	6	1	3
P4	4	2	4

Draw four Gantt charts illustrating the execution of these processes using FCFS, pre-emptive SJF (equal burst length processes are scheduled in FCFS), a pre-emptive priority (small priority number means high priority, equal priority processes are scheduled in FCFS), and a RR (quantum=3) scheduling.
And calculate average waiting and turnaround time for all above mentioned scheduling algorithms.

Also for each of the following transitions between process states, indicate whether the Listed transitions are possible.
(New→ running), (Running → waiting),(Waiting → terminated)
If it is possible, give an example of one thing that would cause it.

Q 5. Suppose that a disk drive has 5000 cylinders, numbered 0 to 4999. The drive is currently serving a request at cylinder 400, and the previous request was at cylinder 300. The queue of pending requests, in FIFO order, is

1500, 400, 910, 1400, 940, 1500, 2020, 170, 1300

Starting from the current head position, what is the total distance (in cylinders) that the disk arm moves to satisfy all the pending requests, using SSTF, C-LOOK and SCAN disk scheduling algorithms?

Which among the following components Global variables, Registers values,
Files of a program state are shared across different threads in a multithreaded process
And why?

Q 6. And which network configuration LAN or WAN would best suit the following environments: A campus student union, Several campus locations across a state-wide university system, A neighborhood? Explain.

Consider two programmers are working on a joint project. Common Files associated with the project should be stored in their directory. Which directory implementation structure they should use and why? Also differentiate between Absolute and Relative pathname.

Explain what may happen if setting the values of Base and Limit registers are not privileged instructions? Also why is it easy to add a new service in microkernel approach?

Unique Paper Code	: 62344328-OC
Name of the Paper	: Computer Networks and Internet Technologies
Name of the Course	: B. A. Programme (Old Course)
Semester	: III
Duration of Examination	: 3 Hours
Maximum Marks	: 75
Year of Admission	: 2015, 2016, 2017, 2018

Instructions for Candidates :

Attempt any four questions.

All questions carry equal marks

Q1. Describe the job of a router and how it is different from switches? How a point to point connection is different from a multipoint connection? Give an example of each.

Write an HTML code to create the following lists:

Restaurant Menu

I. Salads
- Green Salad
- Russian Salad

II. Main Course
a. Veg
- Paneer
- Dal
- Mixed Veg

b. Non Veg
- Chicken
- Mutton
- Fish

Q2. Describe the responsibilities of physical layer in TCP/IP model? Which of the model among TCP/IP and OSI models is used on Internet these days? Which layers of the OSI model are not present in the TCP/IP model? Which layer(s) of the TCP/IP model fulfils the functionality of the missing layers in OSI model?

What is Cascading Style Sheet (CSS)? What are the benefits of CSS? Write code to apply CSS in an HTML document by the following two ways:
- inserting CSS code within the same HTML file, and
- using a separate CSS file.

Q3. Describe different parts of a URL. What is the role of HTTP protocol and at which layer does it work? What are the steps to be followed in order to fetch a web page from a server?

What is the role of an HTML frame? Write the HTML code to create the following frames on a web page:

<table>
<tr><td>frame1</td><td rowspan="2">frame 3</td></tr>
<tr><td>frame 2</td></tr>
</table>

Frame1 should link to an HTML page having content “GOOD MORNING”, frame 2 should link to an HTML page having content “BEST OF LUCK” and the frame 3 should link to the home page of any academic institution.

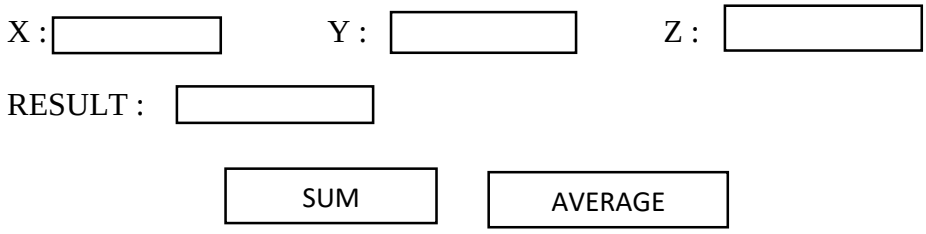
Q4. Among LAN, MAN and WAN, to which category does your college network fall and which category does the "Internet" belong to? What is the purpose of using a repeater in a computer network? Further, in which type of transmission, data is allowed to travel in both directions but only in one direction at a given time.

Write an HTML code to generate the following table:

Roll No	**Name**		**Course**
	First Name	**Last Name**	
100	Charu	Mehta	BA Hons.
101	Adarsh	Gupta	BA Prog.
102	Harsh	Goenka	BA Prog.

Q5. During data communication, how the layered approach works in the OSI model? Use an example to describe the flow of data from one layer to another while passing a message from source to the destination.

Write JavaScript code to create the following form and perform the given operations:



On clicking "SUM" button, the sum of X, Y and Z should be displayed in "Result" box. On clicking "AVERAGE" button, the average of X, Y and Z should be displayed in "Result" box.

Q6. Describe, how a connection is established in connection oriented and connection less protocols? Does the TCP/IP reference model supports both connection-oriented and connectionless service? If yes, describe the protocols supporting each type of service.

Out of the following, which is a valid IPv4 address: 232.67.48.26, 187.34.278.33. Justify your answer.

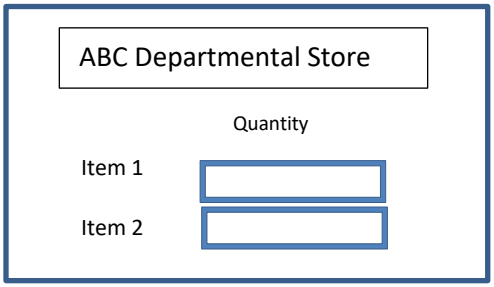
What is the purpose of a <pre> tag in HTML? Write an example of HTML code using <pre> tag.

Unique paper Code	**: 32343305_OC**
Name of the Course	**: B.Sc. (Hons.) Computer Science (CBCS)**
Name of the Paper	**: Android Programming (SEC)**
Semester	**: III**
Year of Admission	**: 2015, 2016, 2017 & 2018**

Duration: **3 Hours** Maximum Marks: **75**

Attempt any **four** questions.
All questions carry equal marks.

1) Develop an android application to help ABC Departmental Store to compute the bill of two items - Item1 and Item2. The application should accept the quantity purchased for both the items. Assume the prize of Item1 and Item2 as Rs. 25/- and Rs. 50/- per piece respectively.



Write Java code to calculate the payable amount (include 18% GST in the final bill) and XML code to display the final bill on the screen as follows:

ABC Departmental Store

Item Name	**Item Price**	**Quantity**	**GST 18%**	**Amount**
Item 1	25	2	9	59
Item 2	50	2	18	118
		Final Bill		**177**

2) Write an Android program using SQLite database with following functionalities:

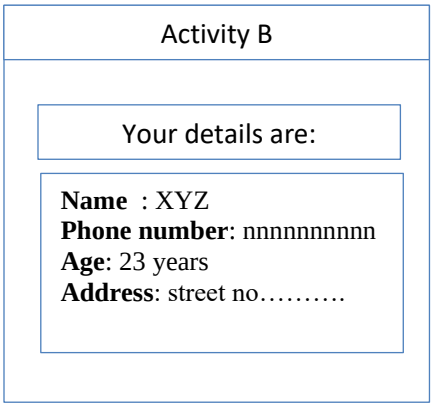
- To create a table Employee (EMP_ID INTEGER AUTOINCREMENT, Name TEXT, Email_Id TEXT, Phone_No INTEGER).
- Create a function to insert the following three records: -

Amit: amit@email.com :991023886

Suman: suman@email.com: 9999942573
Gaurav: gaurav@test.com : 9897865786

- To Delete the record with PHONE_NO = 9999942573.

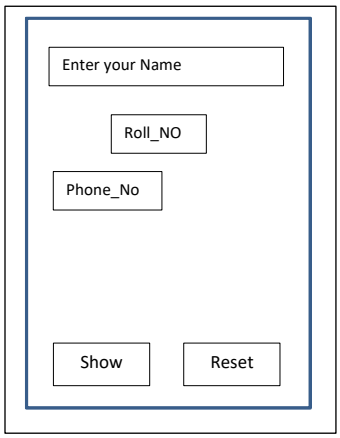
3) What is the use of intent and intent filter? Write Java and XML code for developing the following Android application: An activity 'A' has four EditText input fields 'name', 'phone_number', 'address', 'age', and one button '*Send'*. Check the age entered by user on activity 'A', if the entered age is less than 18 then display a message 'You are not Eligible' on Toast for a short period of time. When a user clicks the '*Send'* button the contents of all the four edit boxes should be sent to the second activity 'B'. On activity 'B', the text received should be displayed as follows:



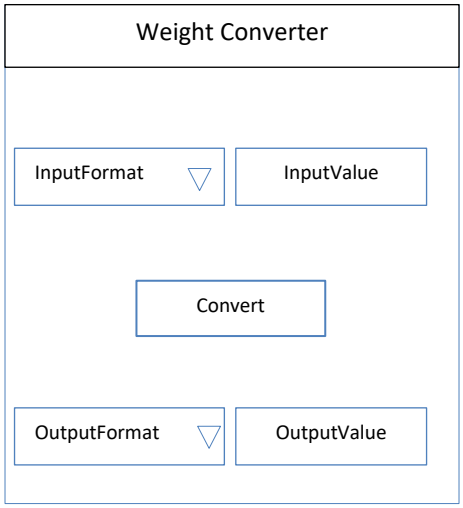
4) How is Dynamic method dispatch useful for resolving call to overridden methods in Java, explain with suitable example?

Consider three activities: *Activity_A,* '*Activity_B* and '*Activity_C*. *Activity_A* calls *Activity_C* when the user presses a button. From *Activity_C* user calls *Activity_B* and then presses the back button once. Write down the status of activity stack (assume the stack is empty initially) and mention the changes in the states of *Activity_A, Activity_B,* and *Activity_C* using lifecycle methods.

5) Develop an android application (shown below) to display following controls: three EditText, and two buttons. When user clicks on *Show* button it should display the information on dialog box and *Reset* button should clear the contents of EditTexts. Write Java code and XML for the layout files using RelativeLayout. What are the advantages of RelativeLayout over LinearLayout?



6) Create an Android Application (layout is shown in the following figure) for weight conversion with one EditText box, one TextView box, two Spinners and two buttons. Write the XML and the Java file code.



The details of five controls are given in the Table:

Label	**Description**
InputValue (EditText)	To take input value from the user
InputFormat (Spinner1)	To set input unit (Pound or Kg)
OutputValue (TextView)	To display output value to the user

OutputFormat (Spinner2)	To set output unit (Pound or Kg)
Convert (Button1)	Convert the content of InputValue in InputFormat to OutputValue in OutputFormat. A toast message is displayed if the InputValue box is empty.
Reset (Button2)	Clear the content of both the InputValue and OutputValue.

Unique Paper Code: 32343306

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

Name of the Paper: Web Design and Development - SEC

Semester: III

Year of Admission: 2019 onwards

Duration: 3 Hours **Maximum Marks: 75**

Instructions for Candidates:
Attempt any four questions.
All questions carry equal marks.

1. Using examples, briefly explain the different methods of creating style sheets. Also, discuss the order of precedence in which these are applied.

   Assuming there is a picture file "mountains.jpg" saved at the location "C:\student\wdd1\mountains.jpg" in the file system. Consider the two HTML statements for including this picture file in a web page given below.

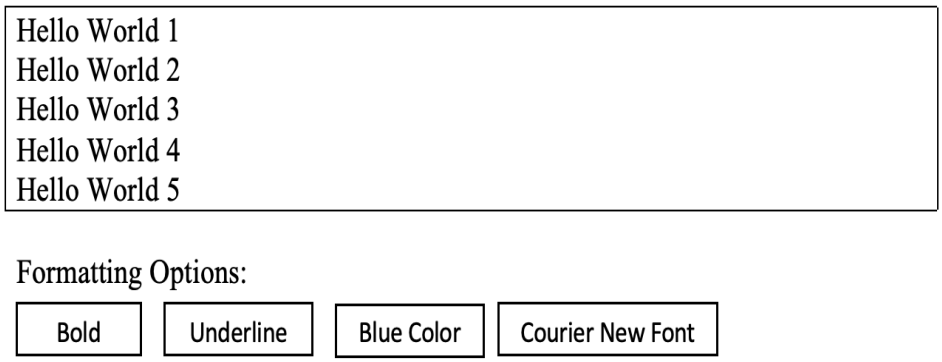
   What is the difference between these two statements? Which one of the two statements is a better way of including images in a web page?

   Using HTML, design a picture gallery showing 9 pictures in a 3x3 grid along with the title of the picture under the image. Using external stylesheet apply the following styles:

   - The background colour of the page should be "yellow".
   - All images should have a thick black border.
   - Every odd row of the grid should have light blue background colour.
   - The title of the picture should be centre-aligned and blue in colour.

2. Write the JavaScript statements to display the number of web pages visited by the user, name and version of the browser used, preferred language of the user and number of plugins available.

Create HTML page displaying the text and apply action for buttons for formatting as shown below:



The "Hello World #" text should be dynamically generated using JavaScript when the page loads and is surrounded by a border. Appropriate formatting should be applied to the text as per the button clicked.

3. Design a webpage using HTML for booking a room in a hotel. The form should accept the following data from user:
    - Name of the person
    - No. of guests going to stay
    - Type of room (Non AC, AC and Suite)
    - Start Date
    - End Date

    Using JavaScript, perform the following validations:
    - Name of the person cannot be blank.
    - No. of guests should be numeric and greater than 0.
    - Type of room must be selected.
    - Start Date should be greater than equal to today's date.
    - End Date should be greater than start date.

    A warning message should be displayed in case any of the mentioned validation fails. The form should have "Submit" and "Reset" buttons.

4. Explain three types of Dialog boxes in JavaScript. Is JavaScript string using double quotes is exactly the same as a string using single quotes? Explain.

Explain the role of cookies in web design and development? Give the syntax to create and read a cookie in JavaScript.

Write a JavaScript code to generate electricity bill by entering number of readings by the user and calculate the bill according to the following conditions:

- For first 50 units – Rs. 3.00/unit
- For next 100 units – Rs. 4.00/unit
- For next 100 units – Rs. 6.00/unit
- For units above 250 – Rs. 7.00/unit

Customer enters the number of units and gets bill amount.

5. What are super-global variables in PHP? Give some examples. Briefly explain different ways of creating arrays in PHP with appropriate examples.

   Using PHP, define an array of 3 products with product code as key and an array of product name, price and quantity as its value. Define the functions to do the following:

   - Search a product for a given product code.
   - Display all the product information, in an ordered list.
   - Calculate the total bill amount.

6. Create an employee registration form with following input fields:

   - Employee ID
   - Name
   - Department
   - Email Address
   - Designation

   Use a drop down for the *Department* field with values "*Sales*", "*HR*" and "*Engineering*". The form should be submitted to a file named *process.php*. The file *process.php* should first validate the data entered and check for empty fields entered by the user. If all the input fields are successfully validated employee data should be saved in a MySQL table, otherwise display appropriate warning message.

   Also, create a PHP page *allemps.php* for displaying all employee data sorted by their names in a tabular format.

Course	**: B.Sc.(H) Computer Science**
Semester	**: III**
Paper Title	**: Operating Systems**
Unique Paper Code	**: 32341302**
Admission Year	**: 2019 onwards**
Max. Marks	**: 75**
Time	**: 3 hours**

Instructions for students:

- ***Attempt any 4 questions.***
- ***All questions carry equal marks.***

Q1.	Suppose that a disk drive has 6,000 cylinders, numbered 0 to 5999. The drive is currently serving a request at cylinder 2350, and the previous request was at cylinder 1800. The queue of pending requests, in FIFO order, is: 2069, 1212, 3296, 2800, 244, 1618, 3856, 1523, 965, 3681 Starting from the current head position, what is the total distance (in cylinders) that the disk arm moves to satisfy all the pending requests for SCAN and C-SCAN disk-scheduling algorithms? Show all the intermediate steps. Consider a disk drive with 10,000 cylinders. Suppose that 50 percent of the disk access requests are for a small set of cylinders between 100 and 800. Which of the following algorithms will take greater advantage of the given situation? Justify your answer. a) Shortest Seek Time First (SSTF) b) First Come First Serve (FCFS) Which of the following instructions should be privileged? Give reasons. a) Modify entries in the open-file table. b) Read the clock. c) Access I/O device.	8 6 4.75

Q2	A given operating system operates in the user and kernel mode of operation. What is the mode of the system at the following points? Justify your answer. a) Boot time b) When the printer generates "Out of paper" error c) When the operating system gains control	6

	Consider a process (id= 2256) creates a child process (id = 2257) and child process further creates a child process (id= 2258). What will be output at statement (1), (2) and (3) along with the process generating this output, for the code given below:
	
	int main()
	{
	int id1= fork();
	cout<<id1; // (1)
	if (id1==0)
	{
	int id2;
	id2= fork();
	cout<< id2; // (2)
	}
	cout<<id1; // (3)
	}
		5

	A computer system with a 32-bit logical address and 4-KB page size supports up to 512 MB of physical memory. Consider a user process that accesses the entire physical memory. How many entries will be there in a conventional single-level page table. How many entries can exist in a two-level hierarchical page table? Justify your answer.	4
	A process P is allocated n frames in the memory (initially all empty). The process page-reference string has length q; n distinct page numbers occur in it. What is the lower bound on the number of page faults? What is an upper bound on the number of page faults? Justify your answer.	3.75
Q3	As a process executes, it changes its state. The state of a process is defined in part by the current activity of that process. Draw a process state diagram. A process P changes its state as mentioned in the table below. Perform the following- a) Identify each state of the process P (S. No. 1-5) b) In the process diagram, mark each state of the Process P (S.No. 1-5).	4.75

S. No	Current Activity
1	P arrives in main memory
2	P starts execution
3	Process Q preempts P
4	P resumes execution
5	P needs to accept some input from user

Consider the following code, for creating a child process using fork( ) system call. Mention the value of 'a' printed by each process at statement (1), (2) and (3). Explain your answer with the help of a parent-child tree diagram. 4

```
void main( )
{
   int a = 7;
   int pid1 = fork();
   if ( pid1 == 0 )
     {
       a++;
      cout<< "value of a is" <<a<<endl;    // (1)
      }
   else
      {
       int pid2= fork();
       if (pid2==0)
           {
            a--;
            cout<<"value of a is"<<a<<endl;     // (2)
            exit(0);
           }
       }
    cout<< "value of a is" <<a<<endl;         // (3)
}
```

	Consider the following set of processes with the burst time given in milliseconds. **Process** | **Arrival Time** | **Burst Time** P1 | 0 | 30 P2 | 5 | 22 P3 | 10 | 15 P4 | 15 | 5 a) Draw a Gantt chart for SRTF (shortest remaining time first and Round Robin (time quantum q= 10 ms) based CPU scheduling algorithms. b) Calculate average turnaround time and average waiting time for each algorithm.	10

Q4	Find the number of unique threads created at statements (1), (2) and (3) each, as specified in the code given below. Additionally in each case mention the process which is creating the thread. Justify your answer.
	
	int main( )
	{
	int x;
	thread_create(...); // (1)
	x= fork();
	thread_create(...); // (2)
	if (x==0)
	fork();
	thread_create(...); // (3)
	return 0;
	}
	
	State True or False:
	
	a) The child process is known as a zombie process when its parent terminates before it.
	
	b) init() is the parent of those processes who do not have a parent.
		4.75
		
		2

	Consider a printing resource having 5 non-shareable instances which may be required by many processes simultaneously. Synchronize the usage of this resource with the help of a semaphore S. a) What type of semaphore will be required for this purpose? b) How will the synchronization be achieved if six processes want to use this resource simultaneously?	6
	Consider a system with 4 types of resources R1 (2 units), R2 (2 units), R3 (2 units), R4 (2 units). A non-preemptive resource allocation policy is used. Three processes P1, P2, P3 request and hold the resources as follows: **Process** | **Requesting** | **Holding** P1 | 1 unit of R1 | 1 unit of R3, 1 unit of R4, 1 unit of R2 P2 | 1 unit of R2 | 1 Units of R1, 1 unit of R3 P3 | 1 unit of R3 | 1 unit of R1, 1 unit of R2, 1 unit of R4 Draw a resource allocation graph and identify the possibility of any deadlock in the system. Give reasons.	6
5	Given memory partitions of 150 KB, 400 KB, 250KB, 300 KB and 650 KB (in order), how would each of the first-fit, best-fit and worst-fit algorithms place processes of 224 KB, 405 KB, 98 KB and 500 KB (in that order)? Which algorithm results in least external fragmentation?	9+1
	Assuming a 2-KB page size, what are the page numbers and offsets for the following address references (provided as decimal numbers) a) 3089 b) 32095 c) 235201	5

<table>
<tr><td></td><td>Consider a paging system with the page table stored in memory.

a) If a memory reference takes 150 nanoseconds how long does a paged memory reference take?
b) If we add a TLB and 77 percent of all page-table references are TLB hits, what is the effective memory reference time? (Assume that finding a page-table entry in the TLB takes zero time, if the entry is there.)</td><td>3.75</td></tr>
<tr><td>6</td><td>Consider the following page-reference string:

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

How many page faults would occur for the following replacement algorithms, assuming three frames? Remember that all frames are initially empty, so your first unique pages will all cost one fault each.

a) FIFO replacement.
b) Optimal replacement.

Consider the following segment table:

<table><tr><th>Segment</th><th>Base</th><th>Length</th></tr><tr><td>0</td><td>200</td><td>446</td></tr><tr><td>1</td><td>2122</td><td>15</td></tr><tr><td>2</td><td>88</td><td>222</td></tr></table>
Compute the physical addresses for the following logical addresses?

a) 0, 336
b) 1, 11
c) 2, 400

Consider a virtual address space of four pages with 1024 bytes each, mapped onto a physical memory of 64 frames.

a) How many bits are used in the virtual address?
b) How many bits are used in the physical address?</td><td>5+5

5

3.75</td></tr>
</table>

Unique Paper Code	:	32341502-OC
Name of the Course	:	B.Sc. Honours (CBCS)
Name of the Paper	:	Theory of Computation
Semester	:	V
Year of Admission	:	2015, 2016, 2017, 2018

Duration: 3 Hours Maximum Marks: 75

Instruction for candidates

1. All questions carry equal marks.
2. Assume $\Sigma = \{a, b\}$ as the underlying alphabet set unless mentioned otherwise.

Attempt any Four Questions out of six Questions.

1.	Build a deterministic finite automaton (DFA) that accepts the language **L**, where **L = { $a^i b^j$ | (i+j) is not divisible by 2}.** Also convert the above DFA into regular expression using bypass algorithm.
2.	For languages $\mathbf{L_1}$ and $\mathbf{L_2}$ described by the corresponding regular expressions $(\mathbf{a}+\mathbf{b})^*\boldsymbol{a}$ and $(\mathbf{a}+\mathbf{b})^*\mathbf{b}$, construct the following a) DFA for **L1** and **L2** and b) finite automata that define $\mathbf{L_1} \cap \mathbf{L_2}$. Trace the word "**aabb**" on the constructed finite automata..
3.	Let $\boldsymbol{\Sigma} = \{\boldsymbol{a}\}$ and **L = {a^p | p is a prime}**. Are the languages **L**, **L*** (kleene closure of L), and $\boldsymbol{L'}$ (complement of L) regular? Justify your answers. Wherever possible, construct the corresponding DFA.
4.	Let $\boldsymbol{\Sigma} = \{\boldsymbol{a}, \boldsymbol{b}, \boldsymbol{c}\}$ and let **L** be a language defined as **L = {$a^n b^{n+m} c^m$ | n,m >=1}.** Construct a CFG that generates the language **L**. Also construct a pushdown automata (PDA) for the language **L**.
5.	Consider the following grammar: S -> 0A0 | 1B1 | BB A -> C B -> S | A C -> S | Λ Eliminate Λ-productions (null productions) followed by the elimination of unit productions in the resulting grammar. Finally after removing any useless symbols, convert the grammar into Chomsky Normal Form.

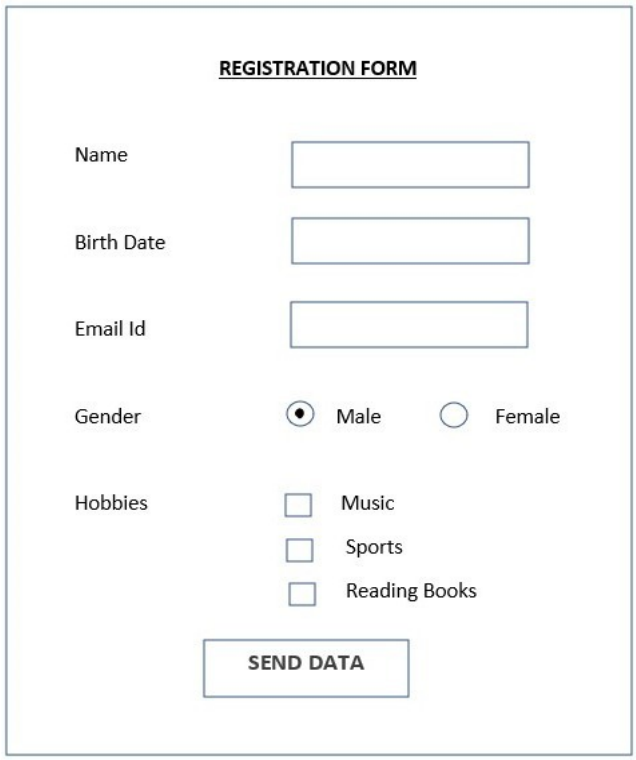
6.	Design a 2-tape Turing Machine (TM) that computes the bitwise AND of two input sequences. The first tape contains $\sqcup w_1 \# w_2 \sqcup$, where w_1, w_2 are bitwise input sequences and '#' is a separator between input sequences. Trace the computation of TM when content of the first tape is $\sqcup 101\#110 \sqcup$ and second tape is empty.

Unique Paper Code	32341501_OC
Name of the Course	B.Sc. (H) Computer Science
Name of the Paper	Internet Technologies
Semester	V
Year of admission	2015-2018
Duration: 3 Hours	Maximum Marks: 75

Attempt any four questions.
All questions carry equal marks.

Q1. Identify the JSP element that can be used directly in template text and in attribute values for action attributes declared to accept request-time attribute values, for both standard and custom actions. Describe any two different ways with example where we use these elements in JSP.

Create an HTML form as shown below. Write a JSP program to access the data submitted by the user in the following form, using JSTL action elements:



Q2. Identify and explain the JDBC statement that will be used in a situation where the user has to provide `departmentName` as "`Computer Science`" at the time of execution of a query.

Create a JDBC program that fetches `LoanTypes` from the `Bank` table having the schema (`BankID, BankName, LoanTypes`) by giving the `BankName` as input to the query at the time of its execution. The program should display the result when a query to fetch all bank records is triggered and should also have the functionality to go to the first, last, previous, next or a particular record.

Q3. Mr. Suresh wants to automate his medical store and has hired you to develop an application for the same. He wants to keep a record of medicines in the store under the following heads: `BatchNo, MedName, ManufacturingDate, ExpiryDate, Price`

Mr. Suresh has provided you with a list of his requirements for this application which are as follows:

- To add one or more medicines
- To delete one or more medicines
- To display one or all medicine records
- To count the number of medicines
- To delete all medicines for which `ExpiryDate` has passed
- To directly copy either the full array or some of the elements of this array to another array without going through the loop

Given the above-mentioned requirements, develop the application in Java.
[Note: Use ArrayList for implementing the records of medicines.]

Q4. Which interface is implemented by JavaBeans and why? How does JavaBeans help us achieve re-usability?

Create a Java bean named `StudentBean` having the properties (`StudentId, StudentName, DOB`). Create a JSP page `StudentInfo.jsp` that instantiates the bean in session scope and sets its properties by accepting data from an HTML form `StudentForm.html` having the same fields as `StudentBean`. The page should then forward the bean properties to another JSP page `DisplayStudentInfo.jsp` that print these bean properties.

Q5. Create an HTML form that has text fields for `FirstName, LastName, AddressLine1,` and checkboxes for `favDesserts` having values `Vanilla_IceCream, Chocolate_pudding` and `Semolina_dessert`.

Create a custom tag "`concat`" with two mandatory attributes `str1` and `str2` which should be concatenated to form one string using tag handler class and a descriptor file. The

values for `str1` and `str2` should be obtained from the fields `FirstName` and `LastName`, respectively, from the given form.

Design a JSP page to perform the following:

- Implement custom tag to display full name
- Pass all attributes of the above form as the parameters to the page `displayInput.jsp` and displays the same

Q6. What would be the output for the code given below? Explain the reasons for each output.

```
<html>

<head>
  <title>JavaScript String concat() Method</title>
</head>

<body>
 <script type="text/javascript">
      var re="m"
      var re2=/kyc/
  var str1 = new String( "Tommorrow is holiday" );
  var str = new String( "james monte marlin" );
  var str2 = new String( "This is string two" );
  var str3 = str1.slice(5,7);
  var str4 = str1.split(re);
  var str5 = str.split(re);

var statement= "my 3 kings beat your 2 aces";
var match3=re.match(statement);
var matches = statement.match(/[abc]/g);
// matches is set up to ["b", "a", "a"]


document.write("str1 is :" + str1 + "<br>");
document.write("str3 is :" + str3+ "<br>");

document.write("str4 is :" + str4+ "<br>");
document.write("str5 is :" + str5+ "<br>");

document.write("statement is :" + statement + "<br>");
document.write("matches is :" + matches + "<br>");
document.write("search is :" + statement.search(re2) + "<br>");
document.write("test is :" + re2.test(statement) + "<br>");
document.write("exec is :" + re2.exec(statement) + "<br>"+"<br>");
document.write("statement.test(re) is :" + statement.test(re2) + "<br>");

 </script>
</body>

</html>
```

Unique Paper Code: 32347504

Name of the Course: BSc(H) Computer Science
Name of the Paper: Microprocessors
Semester: V
Duration:3 Hours
Maximum Marks:75
Attempt any four out of six questions. All questions carry equal marks.

Q1. Differentiate between real mode and protected mode memory addressing. Describe the role of descriptor in protected mode memory addressing. What do you mean by program invisible registers? Discuss the role of program invisible registers. Determine the memory location addressed by the following real mode 80286 register combinations:

- DS = 1000H and DI = 2000H
- DS = 2000H and SI = 1002H
- SS = 2300H and BP = 3200H
- DS = A000H and BX = 1000H
- SS = 2900H and SP = 3A00H

Q2. What is Base-indexed addressing mode? How is base-indexed addressing mode used for accessing arrays? Give an example.
Give the machine equivalent of the following assembly language instruction:

- MOV AX, BX
- MOV [BX+100], CX

Assume opcode of MOV is 100010.
What is the difference between an intersegment and intra-segment jump?
Suppose that SS = 1000H, DS = 0200H, BX = 0300H, and DI = 400H. Determine the memory address accessed by each of the following instructions, assuming real mode operation:

- MOV AL, [1234H]
- MOV EAX, [BX]
- MOV [DI], AL

Q3. Give the role of direction flag in string instructions. With an example show the usage of LODS and STOS to transfer a block of memory from one area to another in the memory. What is REP prefix? How REP prefix is used? Give the function of following instructions:

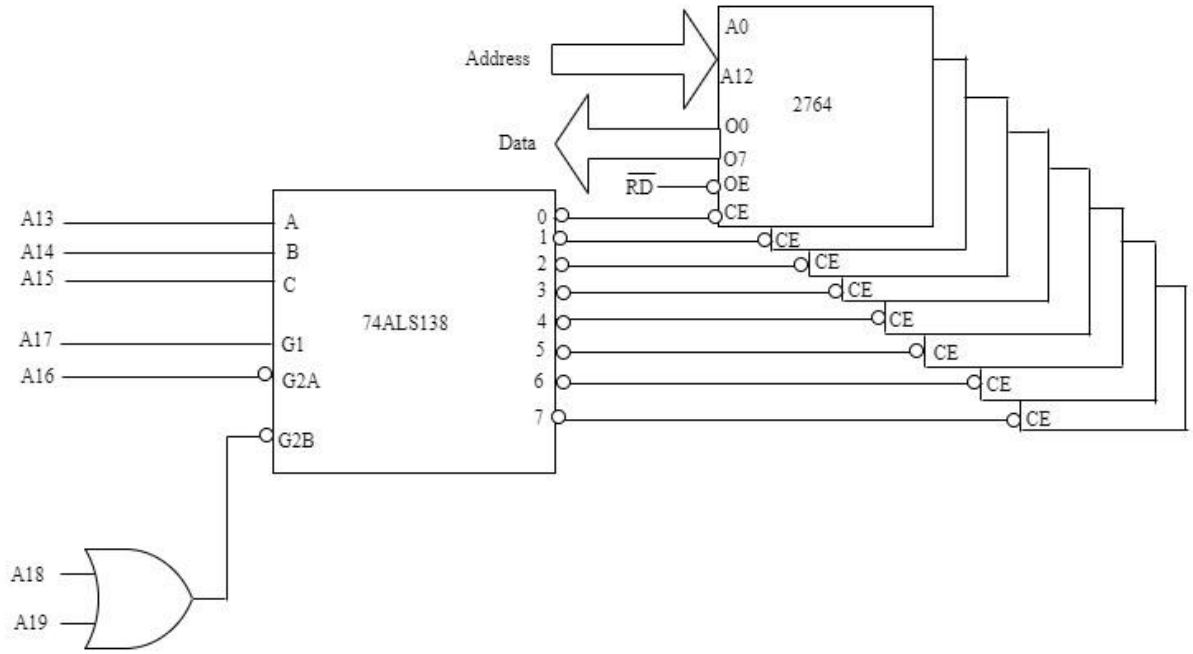
- DAA
- AAM
- AAD
- TEST
- NEG

Q4. Which flag conditions are tested for the following conditional JMP instructions?

- JG
- JA
- JBE
- JLE
- JAE

Give an example of implementation of loop using JCXZ instruction? Differentiate LOOP, LOOPE and LOOPNE instructions. Why is memory address decoding required?

Given the following circuit that uses eight 2764 EPROMS for a 64k*8 section of memory in an 8088-microprocessor based system. Calculate the address range of whole decoder and the address range of output 0 and 4 of decoder.



Q5. List the differences between 8086 and 8088 microprocessors. What mode operation of 8086/8088 is selected when pin MN/$\overline{MX}$ is grounded? Which pins of 8086/8088 are used for DMA request and acknowledge. What happens in 8086/8088 when $\overline{TEST}$ input is at logic 1? Draw and explain the read-write bus cycle for 8086/8088 microprocessor. Explain the mode 1 operation of 82C55 Programmable Peripheral Interface.

Q6. Explain the command registers of 8237 DMA Controller. What is the role of base address and base word count registers of DMA controller? What are three software commands in DMA controller? How DMA controller can be used to copy a memory block to another memory block? Write the main features of Pentium Pro architecture.

Unique Paper Code : 32347508

Name of the Paper : Combinatorial Optimization

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

Semester : V Sem

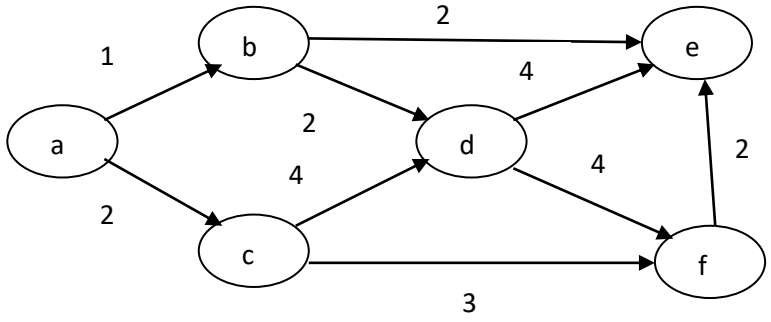
Duration : 3 Hours

Maximum Marks : 75 Marks

Instructions for Candidates:

- All questions carry equal marks.
- Attempt any **four**.

1. Formulate a linear programming problem to maximize the flow of data from node 1 to node 6 for the following network.



List all basic solutions for the following linear programming problem. Determine the feasible solutions amongst them. Also find the optimal solution.

Maximize $z = 3x_1 + 4x_2 + 10x_3$

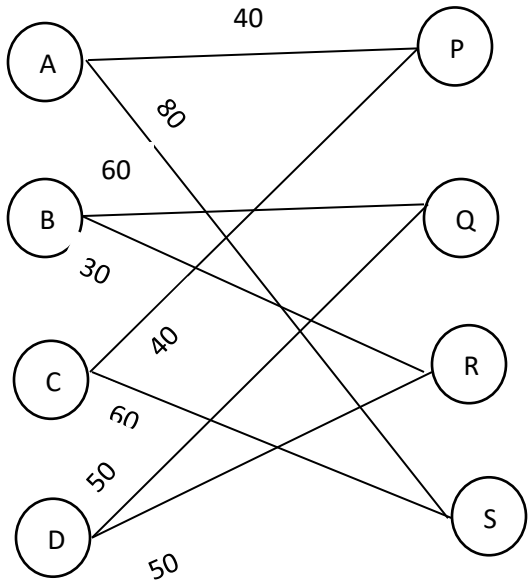
subject to,

$x_1 + x_2 + 3x_3 \leq 15$

$2x_1 + 3x_2 + x_3 \leq 45$

$x_1, x_2, x_3 \geq 0$

Q2 Consider the following bipartite graph, where A, B, C and D are jobs and P, Q, R and S are officials contesting for these jobs. The number on the edge (i, j) denotes the profit earned by the company when the job 'i' is done by the employee 'j'. The CEO of the company wants to assign jobs so that no employee gets more than one job and no job is assigned to more than one employee so as to maximize the total profit.



Formulate an Integer Program to compute a maximum profit matching in the above graph. Write LP relaxation for this Integer Program. Consider the following fractional solution for above maximum weight matching problem: X_{AP}=0.3, X_{AS}=0.7, X_{BQ}=0.8, X_{BR}=0.2, X_{CP}=0.7, X_{CS}=0.3, X_{DQ}=0.2, X_{DR}=0.8. Apply cycle cancelling procedure to above solution to obtain an integral solution. Show all steps. Compare it with fractional solution. Can we obtain a non-integral optimal solution by solving above LP? Justify your answer.

Q3 Write the dual of the following problem.

Max $z = 5X_1 + 6X_2$

Subject to

$$X_1 + 2X_2 = 5$$

$$-X_1 + 5X_2 \geq 3$$

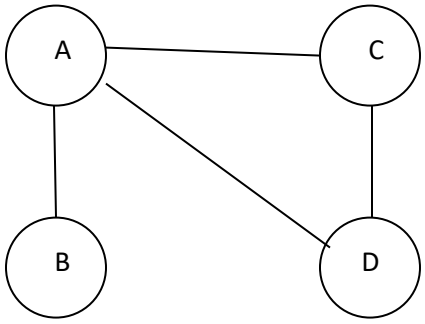
$$4X_1 + 7X_2 \leq 8$$

$$X_1 unrestricted\ , X_2 \geq 0$$

Solve the above problem using simplex method and find the solution of dual using the solution of primal problem

Verify the complementary slackness condition for the primal-dual pair.

Q4 Consider the graph given below:



Formulate an integer program to determine the Maximum independent set of the above graph. Also, formulate the LP Relaxation by relaxing the integrality constraint in above integer program. Solve the linear program to determine the optimal solution. Does the solution of linear program is the maximum independent set of the above graph. Justify.

Q5 Solve the following system of equations using two-phase method

Maximize z= $2x_1 + 2x_2 + 4x_3$

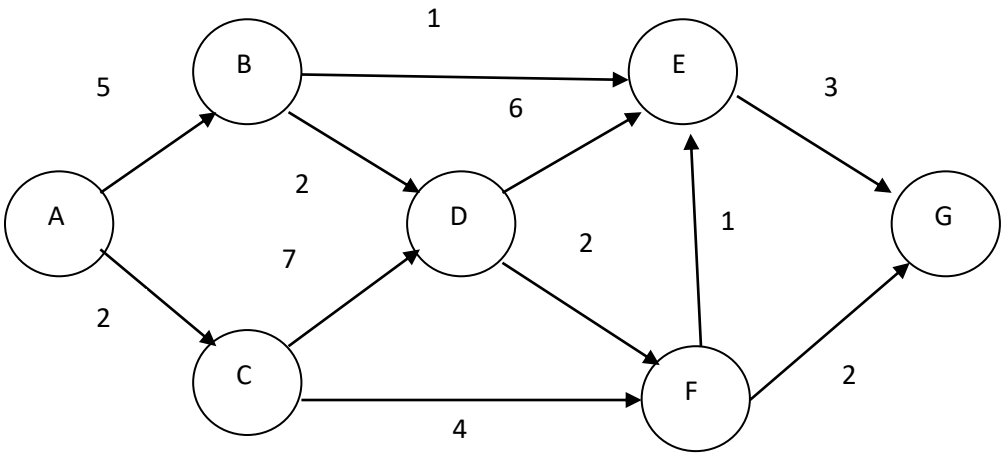
Subject to $2x_1 + x_2 + x_3 \leq 2$

$3x_1 + 4x_2 + 2x_3 \geq 8$

$x_1, x_2, x_3 \geq 0$

State how one can determine whether an LPP has a feasible solution? If a primal LPP has infeasible solution, what kind of solution would be possessed by its dual?

Q6 Determine the maximum flow from node A to node G for the following network using Ford Fulkerson method. The numbers represented on the edges are capacities of corresponding arcs. Show all steps of the calculation.



Let G be an arbitrary flow network, with source s, sink t, and positive "integer" capacity c(e) for every edge e. Consider a minimum s-t cut (S,T) of G. Construct G' by modifying the edge weight in G as follows: c'(e) = c(e)+1 (for each edge e). Now consider the cut (S,T) for G'. Is (S,T) a minimum cut for G' ? Justify your answer.

Unique Paper Code	:	32341502
Name of the Course	:	B.Sc. (H) Computer Science
Name of the Paper	:	Theory of Computation
Semester	:	V
Year of admission	:	2019 and onwards

Duration: Three Hours Maximum Marks: 75

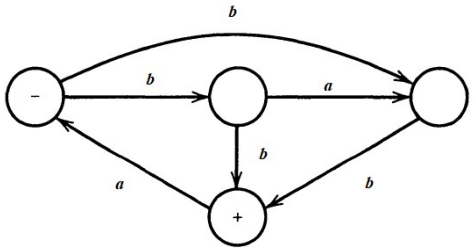
Instructions for Candidates:

i. Attempt any **FOUR** questions.
ii. Each question carries equal marks.
iii. *Consider* **Σ = {a b}** *for all the questions unless specified otherwise.*

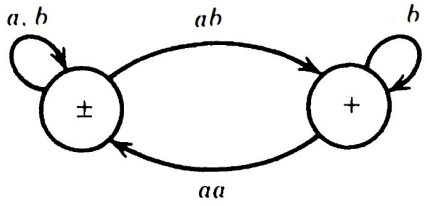
1. Consider the language L, of all the words of length four or more having first two letters same as last two letters.
   For the above language, perform the following:

   - Write all the words of L with the length five or less
   - Write the number of words having length six
   - Construct the regular expression
   - Build Finite Automaton (FA)

2. Prove that it is true for all the regular languages that complement of a regular language is also regular.
   Construct the deterministic finite automaton (DFA) that recognizes the same language as the non-deterministic finite automaton (NFA) given below and also describe the language recognized by it.



   Convert the following transition graph into its equivalent regular expression:



3. Consider the following languages:

   L_1 = Language of all the words having '***b***' at second position

   L_2 = Language of all the words having no two consecutive ***a***'s

   Construct Finite Automaton FA_1 for L_1, FA_2 for L_2. Also construct regular expression and finite automata for the following:

   - $L_1 + L_2$
   - $L_1 \cap L_2$
   - $(L_1)^*$

4. For the language L_3 : $a^{n+m}b^mc^n$; where **Σ = {a b c}** and ***m, n >= 1,*** using pumping lemma, prove that the language is not regular. For the above language, do the following:

   - Write a context free grammar (CFG) for L_3, and construct parse tree for the word ***aaabbc*** using this CFG
   - Build a pushdown automaton (PDA) for L_3

5. Consider the following context free grammars (CFGs):

   G_1: S → bS | aX
   X → bS | aY
   Y → aY | bY | a | b

   G_2: S → XaX | bX
   X → XaX | XbX | **Λ**

   G_3: S → A | AA
   A → B | BB
   B → abB | b | bb

   G_4: S → BABABA
   A → a | **Λ**
   B → b | **Λ**

   For the above CFGs, perform the following:

   - Write a regular expression for the language represented by G_1
   - Convert G_2 into its equivalent CFG without null(**Λ**)-production
   - Convert G_3 into its equivalent CFG without unit-production
   - Convert G_4 into its equivalent Chomsky Normal Form (CNF)

6. Consider the language L_4: $a^nb^nc^n$ where **Σ = {a b c}** and ***n >= 1,*** and perform the following:

   - Build a turing machine M_1, that accepts L_4
   - Build another turing machine M_2, that accepts complement of L_4
   - Is L_4 a recursive language or recursively enumerable language? Justify your answer
   - Is L_4 a context-free language? Justify your answer.

Unique Paper Code	: 32345102-OC
Name of Course	: Computer Science: Generic Elective Honours (CBCS)
Name of the Paper	: Introduction to Programming
Semester	: I
Year of Admission	: 2015, 2016, 2017, 2018

Duration: 3 Hours Maximum Marks: 75

Instructions for Candidates

1. All questions carry equal marks.
2. Attempt any four questions out of six.

1. What will be the output produced on execution of the following C++ code?

```
#include<iostream>
using namespace std;
int temp = 11, count = 10, result = 0;
int main()
{
    int i, count = 100;
    cout << "Count value is " << ++count << endl;
    cout << "Count value is " << count++ << endl;
    for (i = 10; i > 5; i--)
    {
        result += i;
    }
    cout << result << endl;
    result = count - temp % 7;
    cout << result;
    return 0;
}
```

Suggest appropriate data type for the following with suitable reasons:

- `Roll_number` of a student
- `AverageMarks` secured by a student
- Student `status` of Outstation (Y/N)
- `Year_of_Birth` of a student

Check the validity of the variable names with respect to the naming conventions of C++. Justify your answer.

- `@name`
- `Hello`

- `123_var`
- `my%age`
- `getch`
- `_rate`

Write a C++ function `reverseNumber()` that accepts an integer number and returns the reverse of that integer.

(For example, if the number is 456 then it returns 654)

2. Write a C++ function `removeDuplicates()` that accepts a one dimensional integer array as an argument and returns another integer array without any duplicates from the input array.

Note: While removing the duplicates, the final occurrence of the duplicate element must be retained in the resultant array.

(For example: if the integer array is [5, 6, 3, 5, 6] then it returns [3, 5, 6])

Write a C++ function `maxminNo()` that accepts a two dimensional integer `array` and its `number_of_rows` and `number_of_columns` as an argument and returns the maximum and the minimum integer value in the input array.

(For example: if the integer array is [[1,2,3],[4,5,6],[17,8,9]], number_of_rows=3 and number_of_columns=3 then it returns Max=17, Min=1)

3. A ten-digit phone number, such as 2130568996, has three parts: a 3-digit area code (such as 213), a 3-digit exchange code (such as 056), and a 4-digit number (such as 8996). Write a code in C++ that uses a *structure* named `phone` to store these parts of the phone number separately. Declare and initialize a *structure* variable of type `phone`. Also write C++ statements to display the phone number.

Write a C++ program that creates a *structure* `Student` with the following data members: `rollno, name, mark1, mark2.` In the main function create two *structure* instances `s1, s2` and initialize their data members. Calculate the percentage of the marks secured by `s1` and `s2` respectively. Create another *structure* instance `s3` that has the same value as `s1` for its data members. Display the name and percentage of all the students.

A class `First` has private member `x`, protected member `y` and public member `z`. Another class `Second`, creates an object of the class `First`. Which of the following members `x, y, z` can the object of class `First` access and why?

4. Write logical expressions to represent each of the following conditions:

   a) `sharevalue` should be `5000` and above but less than `10000`.
   b) `hobbies` should be either `"Read"` or `"Paint"` or `"PlayGames"`.
   c) `course` is `"BA"` and `marks` should be greater than `90`.

   Define two functions `csaCylinder()` and `volCylinder()` which accept `radius` and `height` as their arguments and return the `curvedSurfaceArea` and `volume` of the cylinder respectively. Invoke the functions in the `main()` and display the result.

   Note: (pi=3.14)
   Curved Surface Area of the cylinder = 2 * pi * r * h
   Volume of a cylinder = pi * r^2 * h

   Write a function `sum_series()` which accepts `n` as an argument and returns the sum of the first `n` terms of the following series:

   S= 1 – 1/3 + 1/5 -1/7 + …….

5. Write a program in C++ to define an abstract class `Place` consisting of the following members: `area` (in square meters) and `capital` (city), a parameterized constructor and a pure virtual function `printData`().

   The program also defines two more classes: `State` and `Union_Territory` inherited publicly the class `Place`.

   Class `State` has a data member `CM_Name` (name of the chief minister of state).

   Class `Union_Territory` has a data member `Governor_Name` (governor of the union territory).

   Define parameterized constructors for both the classes `State` and `Union_Territory`.

   Override `printData`() function for both the derived classes `State` and `Union_Territory`

Define `main()` function which creates instances of each class `State` and `Union_Territory` and displays the data of the objects.

6. Write a program in `C++` to count the number of uppercase and lowercase alphabets present in a text file *book.txt*. Also, the program must copy the uppercase and lowercase alphabets from *book.txt* to *upper.txt* and *lower.txt* respectively.

Write the value of the following expressions when x = 2, y = 4 and z = 6

- `x - y != z || y / x ^ 2 >= z`
- `x % y == z + !x * y / 2 - z`

Show step by step evaluation.

Unique Paper Code	:	**32345104**
Name of the Paper	:	**Programming using Python**
Name of the Course	:	**Computer Science: Generic Elective for Honours**
Semester	:	**I**
Year of Admission	:	**2019 onwards**

Duration: **3 Hours** Maximum Marks: **75**

Attempt any **four** questions.
All questions carry equal marks.

Question 1.

- Write Python functions for the following:
  - Return 1 if a given number is prime or 0 otherwise.
  - Return the number of words in a given sentence.

- Which of the following are valid identifiers in Python? Justify your answer.
  - First Number
  - List#Elements
  - 54Number
  - _FourthNumber
  - Pass
  - del

- Given a file `StudentData.txt` containing student name, course and marks of students. Write a Python function that takes a parameter `n`, reads the data of first `n` students from the file `StudentData.txt` and copies it to another file `Replica.txt`.

- What will be the output generated by the following Python statements? Justify your answer.

```
list1 = list({'GE1': 'Python', 'GE2': 'DBMS',
              'GE3':'CN', 'GE4': 'ISCL'})
print(list1)
print(type(list1))
```

Question 2. What will be the output of the following Python code segments? Justify your answers.

- ```
  marks = 67
  def func(marks, IA):
      IA = 23
      marks = marks + IA
      return marks

  print(func(57))
  print(func(53, 24))
  print(func(67, 12))
  print(func(67, 20, 5))
  ```

- ```
  func = lambda x : x * y
  print(func(5,3))
  ```

- ```
  func = lambda x : x ** x
  print(func(2))
  ```

- ```
  func = lambda x : x * x, y : x + 10
  print(func(4))
  ```

- ```
  a = 0
  while a < 20:
      a += 4
      print(a, end=",")
  else:
      print("In else block")
  ```

- ```
  list1 = [j for i in range(1,6,2) for j in
  range(1, i+2, 2)]
  print(list1)
  ```

Question 3.

- Apply selection sort to the list below. Show the modified list and the index position of minimum index after each iteration of the algorithm:

```
['Siya', 'Anjali', 'Ritu', 'Zoya', 'Rita', 'Payal']
```

What will be the output of the following? Justify your answers.

- ```
  list2 = ['Eleven', 'Twelve', 'Fourteen',
  'Fifteen']
  print(list2.sort())
  list2.sort()
  print(list2)
  ```

- ```
  set1 = {'Python', 'Java', 'R', 'Ruby', 'Pearl'}
  set1.add('PHP')
  set1.add('Ruby')
  print(set1)
  ```

- ```
  tuple1 = (['a', 'b', 'c', 'd'], [2,3,4], ['x',
  'y', 'z'], 9)
  tuple1.append(12)
  print(tuple1)
  ```

- ```
  dict1 = {'Subjects': ['Physics', 'Chemistry',
  'Maths', 'CS'], 'Marks': [93, 97, 95, 92]}
  print(dict1.get('StudentMarks', None))
  print('Music' in dict1)
  print(dict1.keys())
  ```

Question 4. Write Python functions with appropriate comments for the following, taking an integer `n` as an argument:

- To generate sum of the following series for `n` terms:
  1 + 2/2! + 3/3! + …….+ n/n!
  Use appropriate assertions where needed.

- To print all the Armstrong numbers less than `n`. (An Armstrong number is a number whose sum of the cubes of the digits is equal to the number itself. For example, $370 = 3^3 + 7^3 + 0^3$).

- To find the smallest number `n` such that `n*n` > 12000.

- To print the following pattern, here `n` is the number of rows in the pattern. For example, for `n` = 4 it prints:

```
$ $ $ $
  $ $ $
    $ $
      $
```

Question 5.

- What will be the output generated by the following statements? Justify your answers.

```
o 5//2 and 'Hello' > 'Hi'
o 'welcome' * 3 + 7
o y **= 2
o 15 % 5 + 9 - 42 * 2 / 3
o 20 & 35
o 'Ramesh' > 'Mukesh' or 'harry' < 'Harry'
```

- Show the contents of the stack after every operation during evaluation of the postfix expression: `526*93/-*`

- What will be the output generated by these statements? Justify your answer.

```
list3 = ['Abhay', 'Sarita', 'Meenu',
'Shamishta']
list3.insert('Meenakshi')
print(list3)
list3.insert(len(list3)-1, 'Meenakshi')
print(list3)
```

- Identify and describe three different types of errors that may be raised while executing the following code:

```
Percentage = (marks/ total) * 100
```

Question 6. Define a class `Flat_Maintenance` that keeps a record of the payments made by the members of the society for flat maintenance. The class should contain the following:

- data members for `Flat_Maintenance` include: `owner_name`, `flat_number`, `tower_name`, `maintenance_amount`, `month`, and `year`.
- A data member `count` keeps track of number of objects created for this class. Display the value of `count` every time an object is created when a payment is made by a member.

- Define following member functions for the class:
  - a `constructor` function to initialize the members.
  - __str__ function to display the complete details of an object of `Flat_Maintenance`, along with the number of objects of the class.
- Write statements for the following:
  - Take appropriate input values from the user to create an object `Owner1` of this class. (For example: Ramesh of flat number 006 in tower C and wants to pay 3500 for the month of November 2021).
  - Display the details of the object `Owner1`.

Unique Paper Code : **32345301_OC**

Name of the Paper : **Computer Networks and Internet Technologies (GE-III)**

Name of the Course : **Computer Science GE for Honours**

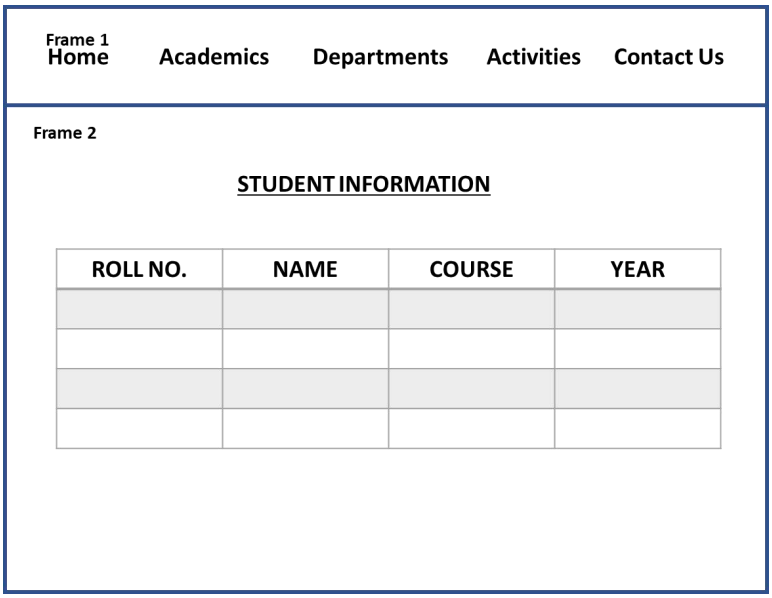
Semester : **III**

Duration of Examination: **3 hours** Maximum Marks:**75**

Attempt any four questions from Question 1 to Question 6.

Each Question carries equal marks.

Q1 With the help of an example, differentiate between a URI and URL. Also explain the components of a URL.



Design the above page using two frames- Frame1 and Frame2. By default, the student information table should be displayed in Frame 2. The first frame contains hyperlinks (Home, Academics, Departments, Activities, Contact Us) which when clicked, the respective webpages should be displayed in Frame 2.

Q2 Explain the layers in which following tasks are performed in the ISO-OSI reference model.

- Physical addressing
- Logical addressing
- Routing
- Session Management
- Encryption/Decryption

Further, differentiate between Cell Spacing and Cell Padding with syntax in ***Table Tag***. Create a table in HTML as shown below:

I	II	III	IV	V	VI	VII
H		Periodic Table of Elements				He
Li	Be				B	Ne
Na	Mg				Al	Ar
K	Ca	Sc	Ti	V	Ga	Kr

Q3 Write a short note on the Internet Protocol (IP) that works at the network layer of the TCP/IP model. Discuss how packets are routed to the destination network.

Further, create a form in HTML as shown below:

LOGIN FORM

Username:

Password:

City of Employment:

Web server: — Choose a server —

Please specify your role: ○ Admin ○ Engineer ○ Manager ○ Guest

Single Sign-on to the following: ☐ Mail ☐ Payroll ☐ Self-service

Login Reset

Q4. With the help of suitable diagrams, explain the different types of network topologies stating the advantages and disadvantages of each topology.

Also, differentiate between simplex, half duplex and full-duplex mode of data transmission. Compare unicast, multi-cast and broadcast mode of communication.

Q5 Differentiate between the terms: Internet, Intranet and Extranet.
What are frames? Discuss the ***Frameset*** tag and the ***iframe*** tag used in HTML to create frames and write HTML code to create the following layout using them.

<table>
<tr><td rowspan="3">FRAME 1</td><td>FRAME 2</td></tr>
<tr><td>FRAME 3</td></tr>
<tr><td>FRAME 4</td></tr>
</table>

Q6 Discuss the role of DNS in the Internet.

Also, create an HTML webpage using CSS and having frames which will appear as follows:

<table>
<tr><td colspan="3">First Frame: Name and address</td></tr>
<tr><td colspan="2">Second frame
Bulleted list of qualifications</td><td>Third frame
Links to favourite sites</td></tr>
<tr><td>Fourth frame
Scrolling message</td><td>Fifth frame
Blinking reminders</td><td>Sixth frame
Image</td></tr>
</table>

Unique paper code	:	32347503_OC
Name of Paper	:	Operational Research for Computer Science (DSE)
Name of the Course	:	B.Sc. (H) Computer Science
Semester	:	V
Duration of Examination	:	Three Hours
Maximum Marks	:	75 Marks
Year of admission	:	2015-2018

Attempt any FOUR questions.
All questions carry equal marks

Q1 Consider the following Linear Programming Problem:

Maximize $Z = 6x_1 + 2x_2$

Subject to

$3x_1 + x_2 \leq 6$

$x_1 + 3x_2 \leq 6$

$x_1, x_2 \geq 0$

Find all the basic feasible solutions. Use the graphical method to find the optimal solution of the given Linear Programming Problem and show graphically that there are infinitely many solutions. List the corner points of the feasible solution space and prove that the solution space formed in the above Linear Programming Problem is convex.

Q2 Solve the following Linear Programming Problem using Big-M method.

Max $Z = 6x_1 + 4x_2$

Subject to constraints

$2x_1 + 3x_2 \leq 30$

$3x_1 + 2x_2 \leq 24$

$x_1 + x_2 \geq 3$

$x_1, x_2 \geq 0$

Comment on the nature of solution.

Q3 Write the dual of the following LPP.

Minimize $Z = 4x_1 + x_2$

Subject to,

$$3x_1 + x_2 = 3$$

$$4x_1 + 3x_2 \geq 6$$

$$x_1 + 2x_2 \leq 4$$

$$x_1, x_2 \geq 0$$

Solve the dual and obtain the value of the primal variable from the optimal table of the dual.

Q4 A company has three production shops supplying a product to four warehouses. The cost of production varies from shop to shop, and the cost of transportation from one shop to a warehouse also varies. Each shop has a specific production capacity and, each warehouse has a certain amount of requirement. The cost of transportation is as given below.

WAREHOUSE

SHOP	I	II	III	IV	**SUPPLY**
A	19	30	50	10	7
B	70	30	40	60	9
C	40	8	70	20	18
DEMAND	5	8	7	14	

Find an initial basic feasible solution of the above transportation problem by the Least-Cost method. Obtain the optimum solution using the U-V/Iterative method.

Q5 There are three categories of income taxpayers in India, those who never evade taxes, those who sometimes do it, and those who always do it. An examination of the audited tax returns from one year to the next shows that of those who did not evade taxes last year, 95% continue in the same category this year, 4% move to the "sometime" category, and the remaining moves to the "always" category. For those who sometimes evade taxes, 6% move to "never", 90% stay the same, and 4% move to "always". As for the "always" evaders, the respective percentages are 0%, 10%, and 90%.

Express the problem as a Markov chain and write the Transition Probability Matrix (TPM). Draw the transition diagram. In the long run, what would be the percentages of "never", "sometimes", and "always" tax categories? Statistics show that a taxpayer in the "sometimes" category evades taxes on about $5000 per return and in the "always" category on about $12,000. Assume income tax payers are 70 million, and the average income tax rate is 12% then determine the annual reduction in collected taxes due to evasion.

Q6 A departmental store employs one cashier at its counter. Customers arrive according to a Poisson distribution at the rate of 9 customers every 5 minutes. The service time per customer is Exponential at the rate of 10 customers every 5 minutes.

Determine, the average number of customers in the system, the average number of customer in the queue, the average time a customer spend in the system, the average time a customer wait before being served, the probability that cashier is idle, the probability that cashier is busy, and the probability that there are 2 customers in the system.

Unique Paper Code : 62341101

Name of the Course : B.A. (Prog.) Computer Applications

Name of the Paper : Computer Fundamentals

Semester : I

Duration : 3 Hours

Maximum Marks : 75

Year of Admission : 2019-2020

Instructions for Candidates:

Attempt any four questions. All questions carry equal marks.

Q1. Explain various components of a digital computer. Mention four characteristics of computers. Write a note on "how computer technology became saviour in the pandemic?"

Q2. (a) Convert the following:

(i) $(61578)_{10}$ = (____)$_2$

(ii) $(10001001)_2$ = (____)$_{10}$

(iii) $(1011101100)_2$ = (____)$_8$

(iv) $(68)_{10}$ = (___)$_8$

(b) Perform the following arithmetic operation using signed 2's complement notation for negative numbers. Use 8 bits to accommodate each number together with its sign.
(-36) + (-18)

Q3. What are ports and interfaces in a computer? Explain different types of USB ports. Explain the working of a Magnetic Disk.

Q4. Why is Cloud Computing important in modern systems? How Cloud Computing lowers IT costs? Compare various models of cloud services.

Q5. Why is software important in computer systems? What is the difference between system software and application software? Explain three real time scenarios where we use these software.

Q6. Write a short note on the following:

a. Bluetooth is an alternative to wire connections in today's era.
b. Why have data mining techniques rapidly accelerated over the last couple of decades?
c. Advantages and limitations of mobile computing
d. Why is Big Data important? Explain three **Vs** of big data.

Unique Paper Code	**:**	**62341101**
Name of the Course	**:**	**B.A. (Prog.) Computer Applications**
Name of the Paper	**:**	**Computer Fundamentals**
Semester	**:**	**I**
Duration	**:**	**3 Hours**
Maximum Marks	**:**	**75**
Year of Admission	**:**	**2019-2020**

Instructions for Candidates:

Attempt any four questions. All questions carry equal marks.

Q1. Explain the functioning of a computer system. Give the classification of computers according to their speed, capacity and purpose. Write any four applications of computers in education system.

Q2. (a) Convert the following numbers:

(i) $(116.25)_{10}$ = (____)$_{16}$.

(ii) $(10111.010)_2$ = (____)$_8$

(iii) $(256.47)_8$ = (____)$_{10}$

(iv) $(BCD.A0)_{16}$ = (___)$_8$

(b) Perform the following arithmetic operation using signed 2's complement notation for negative numbers. Use 8 bits to accommodate each number together with its sign.

(-34) + (-17)

Q3. Differentiate between the following:

(i) Serial Access and Random Access

(ii) MICR and Bar-Code Reader

(iii) Parallel port and Serial port

(iv) Inkjet Printer and Laser Printer

Q4. Explain the memory hierarchy with the help of a diagram and categorize the various types of computer memory in terms of cost, storage and speed. Compare the features of primary memory with secondary memory.

Q5. What do you mean by software package? Explain relationship between hardware and software. What is the role of system software in the computer system? Explain any four system software.

Q6. Explain Cloud Computing and give its advantages as an emerging paradigm. What is the role of Cloud Computing in the field of research and education, with emphasis on its application in social sciences research?

Unique Paper Code	: 62344328-OC
Name of the Paper	: Computer Networks and Internet Technologies
Name of the Course	: B. A. Programme (Old Course)
Semester	: III
Duration of Examination	: 3 Hours
Maximum Marks	: 75
Year of Admission	: 2015, 2016, 2017, 2018

Instructions for Candidates :

Attempt any four questions.

All questions carry equal marks

Q1. Describe the job of a router and how it is different from switches? How a point to point connection is different from a multipoint connection? Give an example of each.

Write an HTML code to create the following lists:

Restaurant Menu

I. Salads
- Green Salad
- Russian Salad

II. Main Course
a. Veg
- Paneer
- Dal
- Mixed Veg

b. Non Veg
- Chicken
- Mutton
- Fish

Q2. Describe the responsibilities of physical layer in TCP/IP model? Which of the model among TCP/IP and OSI models is used on Internet these days? Which layers of the OSI model are not present in the TCP/IP model? Which layer(s) of the TCP/IP model fulfils the functionality of the missing layers in OSI model?

What is Cascading Style Sheet (CSS)? What are the benefits of CSS? Write code to apply CSS in an HTML document by the following two ways:
- inserting CSS code within the same HTML file, and
- using a separate CSS file.

Q3. Describe different parts of a URL. What is the role of HTTP protocol and at which layer does it work? What are the steps to be followed in order to fetch a web page from a server?

What is the role of an HTML frame? Write the HTML code to create the following frames on a web page:

<table>
<tr><td>frame1</td><td rowspan="2">frame 3</td></tr>
<tr><td>frame 2</td></tr>
</table>

Frame1 should link to an HTML page having content “GOOD MORNING”, frame 2 should link to an HTML page having content “BEST OF LUCK” and the frame 3 should link to the home page of any academic institution.

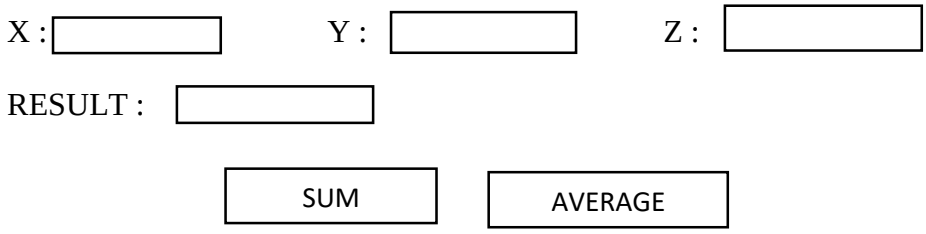
Q4. Among LAN, MAN and WAN, to which category does your college network fall and which category does the "Internet" belong to? What is the purpose of using a repeater in a computer network? Further, in which type of transmission, data is allowed to travel in both directions but only in one direction at a given time.

Write an HTML code to generate the following table:

Roll No	**Name**		**Course**
	First Name	**Last Name**	
100	Charu	Mehta	BA Hons.
101	Adarsh	Gupta	BA Prog.
102	Harsh	Goenka	BA Prog.

Q5. During data communication, how the layered approach works in the OSI model? Use an example to describe the flow of data from one layer to another while passing a message from source to the destination.

Write JavaScript code to create the following form and perform the given operations:



On clicking "SUM" button, the sum of X, Y and Z should be displayed in "Result" box. On clicking "AVERAGE" button, the average of X, Y and Z should be displayed in "Result" box.

Q6. Describe, how a connection is established in connection oriented and connection less protocols? Does the TCP/IP reference model supports both connection-oriented and connectionless service? If yes, describe the protocols supporting each type of service.

Out of the following, which is a valid IPv4 address: 232.67.48.26, 187.34.278.33. Justify your answer.

What is the purpose of a <pre> tag in HTML? Write an example of HTML code using <pre> tag.

Unique Paper Code	:	**62347502**
Name of the Course	:	**B.A. Programme (Computer Applications)**
Name of the Paper	:	**Programming in Java**
Semester	:	**V**
Duration	:	**3 Hours**
Maximum Marks	:	**75**
Year of Admission	:	**2019 onwards**

Instructions for Candidates

All questions carry equal marks. Attempt any ***FOUR*** questions.

Q. 1) a) Java is a platform independent programming language. Explain in your own words.

b) Consider the following data of a student: *Name*, *Age*, *Gender*, *Class*, *Section*, *Father's Name*, *Mother's Name*, *Address*, *Mobile* and *Marks*. Suggest a suitable datatype in Java for each of the given data.

c) Write a method in Java that initializes the given data by taking input from the user.

Q. 2) a) Explain any three types of literals in Java with the help of examples.

b) Differentiate between Type Conversion and Type Promotion in Java with the help of examples.

c) A set of statements has to be repeated N times in Java. Which looping structure has to be used? Give reasons for choosing the looping structure.

d) Consider the following code in Java:

```
if (age < 13) {
    System.out.println("Person is Child");
}
else if (age < 19) {
    System.out.println("Person is Teenager");
}
else if (age < 45) {
```

```
        System.out.println("Person is Adult");
    }
    else if (age < 60) {
        System.out.println("Person is Middle-aged");
    }
    else {
        System.out.println("Person is Senior Citizen");
    }
```

What will be the output of the above given code if age is 45? Rewrite the above sequence using Switch-Case in Java.

e) Write a method in Java to check whether a number is positive or negative. Provide the user input.

Q. 3) a) Consider a two dimensional array in java. The integer array is of 5 by 6 size. Write code in Java to initialize the array using loop, with each element containing the remainder of the division of product of its indexes by 4.

b) Explain with the help of examples to differentiate between "<<" and "<<<" operators.

c) How many types of relational operators are there in Java? Write a code in Java to illustrate the use of each of them.

d) Consider the following code in Java:

```
int i = 0;
void try(){
    int j = 1;
    System.out.println(i);
}
```

What will be output of the above given code? What is the scope of the variables in above given code? Suppose statement "int j = 1;" is replaced with "int i = 1;". What will be the output after the replacement of the statement? Justify your answer.

Q. 4) a) Consider the following data members: *Name*, *Age*, *Gender*, *Address*, *Mobile Number*, *Position*, *Department* and *Salary*. Define a class *Employee* in Java for this

data. The class should contain a method for inputting the values for all the data members from the user. The class should also contain a method to display them.

b) Explain which concept of OOP is applied here.

c) Describe how Garbage collection works in Java with the help of above mentioned class.

Q. 5) a) Create a superclass named *Shape* which consists of a Empty Constructor. This class is inherited by a subclass *Quadrilateral* which consists of a constructor and an abstract method *Perimeter*. Further, *Quadrilateral* subclass is inherited by three subclasses namely, *Rectangle*, *Square* and *Circle*. Write the code in Java to implement these five classes.

b) Suppose class *Square* also wants to inherit from the class *Shape*. Can *Square* class inherit from both *Quadrilateral* and *Square* classes? Give reasons.

c) How can we ensure that our class cannot be inherited? Explain with the help of examples.

Q. 6) a) Consider a method *Compute* in Java. It has two inputs, x and y. The method *Compute* checks whether the number x is prime or not. In case it is prime, the method prints the sum of first y natural numbers. However, in case, x is not prime, the method prints the first y Fibonacci numbers. Implement the method *Compute* in Java.

b) Write logical expressions to represent each of the following conditions:

Marks scored are greater than 300 but less than 500

The *category* is either 'A' or 'D'

The *experience* is less than 4

Value is between 2000 and 2500.

Unique Paper Code	:	32341501
Name of the Course	:	B.Sc. (H) Computer Science
Name of the Paper	:	Internet Technologies
Semester	:	V
Year of admission	:	2019 and onwards

Duration: Three Hours Maximum Marks: 75

Attempt any **FOUR** questions.
Each question carries equal marks.

Q1. Define the purpose of subnet masking. Consider the IP address 165.245.12.88/24, what would be the 32-bit subnet mask? What is the class of this IP address? Give the first IP address and last IP address of the class to which the above IP address belongs. Calculate the following for the above IP address with appropriate explanation:

- Maximum no. of subnets
- Maximum no. of hosts per subnet
- Network Address
- Broadcast address
- First usable IP address for host
- Last usable IP address for host

Q2. How HTTPS is more secure than HTTP?

Which technologies (at the minimum) are needed to create a fully dynamic web page? What is the purpose of AJAX process?

Consider a network scenario, where computer X is connected to a LAN using a NAT router. X wants to send a packet through internet to computer Y which is connected to another LAN and is also using a NAT router. For the above scenario, describe the following concepts with the help of suitable diagram(s):

- Mapping of private and public IP addresses
- Mapping of inside local, inside global, outside local and outside global IP addresses

Which command is used to know the network route between computer X and Y?

Q3. Suppose you are a wildlife photographer, and frequently visits national parks, wildlife and bird sanctuaries. What will you prefer among blog and forum to showcase your knowledge and talent of photography and why? Also, give reasons why the other choice is not suitable? Consider the following array of objects in JavaScript:

Index	Value
0	{name: Jim Corbett National Park, state: Uttrakhand, speciality: Tigers}
1	{name: Kaziranga National Park, state: Assam, speciality: Rhinos}
2	{name: Asola Bhatti Wildlife Sanctuary, state: Delhi, speciality: Birds}
3	{name: Gir National Park, state: Gujarat, speciality: Lions}

Write code for ***parks.html*** which displays the above array of objects as a table. The webpage should also display two text boxes, one for the index and another for the property name along with a submit button. Further, write JavaScript code for ***parks.js***, which will display the value of the property according to the index no. and the property name entered by the user on the browser.

Q4. Differentiate between anonymous function, function expression and immediately invoked function expression.

Suppose we already have an HTML file with 3 input elements of text type and 1 div type. The value of the **id** attribute of 3 input elements are: *length, breadth* and *height* and the value of **id** of div element is: *volume*. Write JavaScript code for the following:

- To access the value of these 3 input elements and div element
- Anonymous function to calculate the volume of the cuboid
- Immediately invoked function expression to display the volume of the cuboid in the html element having id "*volume*"

With the help of an example, differentiate between parameters and arguments of the JavaScript function.

Q.5 Create an HTML form in a file called ***car.html*** to get the following details of the car:

- Name of the manufacturer
- Name of the model
- Manufacturing Year
- Fuel type (petrol/diesel)
- Color
- Seating capacity
- Cubic capacity

Write JQuery code in a JavaScript file ***car.js*** to get the details of the car from the ***car.html*** on pressing submit button. Also write the JavaScript code in ***car.js*** to make a JavaScript object and JSON object from the above details and print both the JavaScript and JSON object on the console.

Differentiate between innerHTML, textContent and innerText property of the JavaScript.

Q6. Describe the purpose of the code given below with proper explanation of each statement and method used. Is there any callback function used in the code? If yes, then give the line number(s) where it is being called, and if not then give an example of callback function:

```
1. const http = require('http');
2. const port = 3000;
3. const server = http.createServer(function(req, res){
4. res.statusCode = 200;
5. res.setHeader('Content-Type', 'text/html');
6. res.write("Hello World...");
7. res.end();
8. });
9. server.listen(port, () => {
10. console.log('Server is listening on port ' + port);
11. });
```

Suppose we have a mysql database with the name "*mydb*" having a table named "*customer*". The fields of the table are: *CustID, CustName, CustCity*. Write NodeJs commands to connect to the database "*mydb*" and print all the details of customers who are living in Delhi.

Unique Paper Code	: 62343318_OC
Name of Course	: B. A. (Prog.) Skill Enhancement Courses (SEC-I) (Old Course)
Name of the Paper	: Office Automation Tools
Semester	: III
Year of Admission	: 2015-2018

Duration: 3 Hours **Maximum Marks: 75**

Attempt any **four** questions.

All questions carry equal marks.

1. Differentiate between COUNTIF () and COUNT () functions in a spreadsheet giving suitable examples of their usage.

Month	**Magazine**	**New Customers**
January	Accounting weekly	10
February	CPA Journal	12
January	Financial times	14
March	Accounting weekly	10

Consider the above table; write the steps to insert a pivot table to calculate the total number of **New Customers,** for every month. The pivot table should appear as follows:

Month	**New Customers**
January	
February	
March	

2. Mr. X is the HR Head in an organization and he has to send personalized interview letters to 500 candidates. The letter should have Name of Candidate, Address, Phone Number and E-mail id, followed by the content of the letter, informing them about the interview to be held on 15 December 2021 at 10:00 am. What feature of word processing software will you propose? Write in detail the steps required for performing the above-mentioned job.

How many files and what type of files are required?

Explain how this method is better than the manual way of sending individual letters to the candidates.

3. Write the functions for the operations (a) –(e) based on the spreadsheet given below along with the relevant cell addresses:

	A	**B**	**C**	**D**	**E**	**F**	**G**
1	Roll No.	Name	Hindi	Maths	Science	Total(300)	Percentage
2	CA1	A	99	98	90		
3	CA2	B	96	92	87		
4	CA3	C	90	88	80		
5	CA4	D	98	100	93		
6	**Average**		***	???	!!!		
7	**MAX**						

a) To calculate Total marks as sum of Hindi, Maths, Science for each student and display them in Column F
b) Using Total marks out of 300 computed in part (a), calculate percentage of each student and display them in column G
c) To calculate Average marks obtained in each subject, Hindi, Maths, science to be stored at locations in row 6, marked ***, ???, and !!! respectively.
d) To calculate Maximum marks of Hindi, Maths, Science and display them in Row 7
e) To display the count of students having Total > 280

What parameters are passed in *VLOOKUP ()* function in a spreadsheet? Write *VLOOKUP* formula for accessing the Science marks of the student with Roll No. "CA2" given in the above spreadsheet.

4. Write three important features of thunderbird.

What do you understand by spam mail in Microsoft Outlook?

Differentiate between function and formula in the context of spreadsheets. Write both function and formula to find the sum of values present in the cells A1, B1, and

C1. Also, write a formula that finds the maximum of the values in the cells A1, B1, and C1 and store it in cell D1.

5. Mr. X has made a report using a word processor, but he is unable to perform the following task. You need to help him by writing the steps for the following text formatting options:

   i. Numbering list
   ii. Superscript
   iii. Alignment
   iv. Spelling and Grammar

How can we insert headers and footers in a document?

6. Spreadsheets are made of cells. How do you refer to a cell in a spreadsheet and what are the various referencing modes available? Explain in detail giving suitable examples. Which referencing mode is useful when we need to copy the formula from one cell to another?

What is the importance of charts? List three charts available. Write the steps to create a Line Chart for the following data stored in cells A1 to B5.

	A	B
1	Name	Marks
2	A	86
3	B	75
4	C	80
5	D	93
6	E	90

Unique Paper Code : **62343319**

Course Name : **B.A.(Programme)**

Name of Paper : **PHP Programming (SEC)**

Semester : **III**

Date of Admission: : **2019 onwards**

Duration: **3 Hours** Maximum Marks: **75**

Attempt any **four** questions.
All Questions carry equal marks

Q1. What are the characteristics of PHP variables?

Identify and justify the valid PHP variable names:
$GasPrice, $9xyz, $_myname, $Total-Marks, number, $echo

What will be the output of the code below? Justify your answer.

```
$x = 5;
echo $x;
echo "<br />";
echo $x++ + $x++;
echo "<br />";
echo $x;
echo "<br />";
echo $x-- - $x--;
echo "<br />";
echo $x;
```

Construct logical expressions in PHP for representing the following conditions:

- Salary is greater than 40,000 and less than 55,000.
- Gender is male and Age is greater than 65.
- Length of string variable `$text1` is greater than 10.

Q2. Write a PHP program to calculate the total electricity bill depending on the units consumed, based on the following assumptions:

- For first 50 units – Rs. 3.50/unit
- For next 100 units – Rs. 4.00/unit
- For next 100 units – Rs. 5.20/unit
- For units above 250 – Rs. 6.50/unit

What will be the output of the following PHP script? Write step-by-step execution:

```
<?php
    $x = 10;
    $x /= 5;
    echo $x;
    $a = 15;
    $a %= 4;
    echo $a;
 ?>
```

What will be the output of the following PHP script? Justify your answer.

```
<?php
function  display($a=5, $b=7){
echo $a, $b;
}
display(15,16);
display(); //passing no value
display(34);
?>
```

Q3. List the advantages of using functions?

Explain how inbuilt functions are different from user defined functions.

Write a PHP function `minimum($num1, $num2)` to calculate smallest of the two numbers. Use this function to find smallest of three numbers in PHP program.

Given the following recursive function:

```
function factorial($n)
    {
     if ($n < 0)
     return -1;
     if ($n == 0)
     return 1;
     return ($n * factorial ($n -1));
    }
```

Explain step by step execution of the function call `factorial(6)`. What will be the output of `factorial(6)`?

Q4. Write a PHP program to calculate the sum of square of *n* terms of the following series, where *n* can be any value assumed by the user.

$$1+2^2 + 3^2 + 4^2 + 5^2 + \ldots\ldots\ldots\ldots\ldots\ldots + n^2$$

Evaluate and justify the output of the following expressions

- `X= 6/2*4+32/8+5`
- `Y=3*4/2+2/2+6-4+4/2`
- `Z=7**2/9%3`

What will be the output of `$x` after the execution of the statement? Justify your answer.

```
$x = 3 + "15%" + "$25"
```

Q5. What do you understand by string data type in PHP?

Given the following string variable:

```
$str = "skilling is possible from learning"
```

Write PHP statement(s) to perform the following operations:

- Remove "skilling" from the string `$str`.
- Search the position of the word "possible" in the string `$str`.
- Count the number of words in the string `$str`.
- Replace the word "skilling" witin the string `$str` with "earning".
- Find the length of the string `$str`.

Write a PHP function having an argument as string that returns TURE if the given string is palindrome otherwise return FALSE.

Q6. What do you understand by an array in PHP? List and explain the different types of arrays in PHP.

Write a program that return the length (the number of elements) of an array and also print the array elements.

Which PHP array method will be used to sort the `$shapes` array alphabetically.

```
$ shapes =array("line", "cube", "cuboid", "Triangle",
"square")
```

What will be the output of the following code? Show the output of the code at each iteration after execution.

```
<?php
for ($x = 0; $x < 10; $x++)
      { if ($x == 5)
           {break; }
         echo "The number is: $x <br>";
        }
?>
```

Write the output for the following PHP script and justify your answer:

```
<?php
$age = array("Meera"=>"35", "Seeta"=>"37", "Rani"=>"43");

 foreach($age as $x => $x_value)
  {
  echo "Key=" . $x . ", Value=" . $x_value;
  echo "<br>";
 }
?>
```

Unique Paper Code	:	62345501
Name of the Course	:	B.A. (Prog.) GE (CBCS)
Name of the Paper	:	IT Fundamentals
Semester	:	V
Year of Admission	:	2019

Duration: 3 Hours Maximum Marks: 75

All questions carry equal marks.
Attempt any Four Questions.

1.
- Differentiate between data integrity and data inconsistency with respect to database.
- Define the structure of number system and convert the following numbers from Binary to Decimal representation:

  10011000
  1000.1111
  10000.011
- Convert the following numbers from Decimal to Binary representation.

  1456
  14.56
  199

2. Which one is the fastest memory among register and cache memory? Justify your answer. Explain various types of registers and cache memory. What is the use of BIOS in computer system?

3. What are system and application softwares? What are the services provided by the Operating System? What is the significance of device drivers?

4. Describe the various components of Database system. Describe entities, attributes and relationships, with suitable examples. Elaborate the following formulas based on table given below:

	A	B	C	D
1	NAME	QUIZ1	QUIZ2	QUIZ3
2	ANDY	95		99
3	BOB	80	78	75
4	BETTY	78	89	67
5	FRANK		90	92
6	FRED	65		98
7	JAMES	56	91	
8	LISA	98	92	65

COUNTIF (B2:D8,”>78”)
AVERAGEA (C2:C8)
MAXA (B2:C8)
SUMIF(B2:D8,”<90”)

5. Differentiate between LAN, WAN and MAN. What are the various categories of wireless networking devices? Explain the architecture of Internet and IP addresses.

6. Draw a block diagram to illustrate the basic organization of computer system and explain the functions of its various units. Explain various pick and pointing input devices. List any two devices which act as input as well as output devices.