16086

Sr. No. of Question Paper : 1024

C

Unique Paper Code : 32341102

Name of the Paper : Computer System Architecture

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

Semester : I

Duration : 3 Hours

Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.

2. Section A is compulsory.

3. Attempt any four questions from Section B.

4. Parts of a question must be answered together.

SECTION A

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

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

(2)

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

(2)

(d) Represent the following decimal number 165.29 in BCD

(2)

(e) What is Hardwired control unit?

(2)

(f) Differentiate between Program Counter and Address Register.

(2)

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

(3)

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

(i) BUN: Branch Unconditionally

(ii) ISZ: Increment and Skip if Zero

(4)

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

(4)

(j) Given the following Boolean function :

(4)

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

(i) Simplify F using Boolean algebra

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

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

(4)

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

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

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

(4)

P.T.O.

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

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

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

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

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

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

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

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

(4)

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

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

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

(6)

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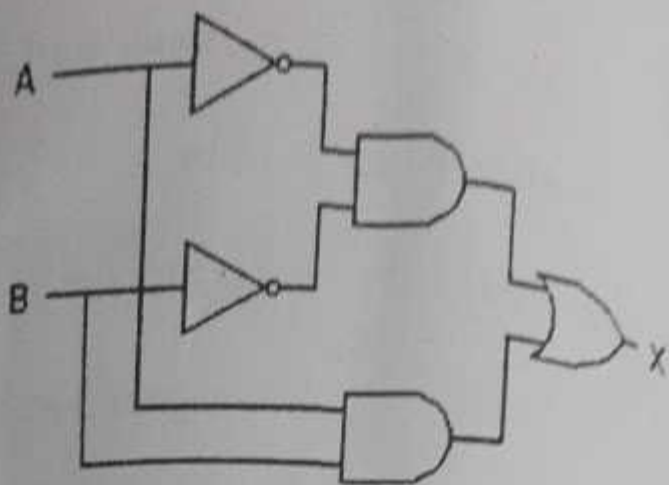
(4)

Q
2

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

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.

2. Question No. **1** is compulsory.

3. Attempt any **4** questions from Question **2** to Question **7**.

4. Parts of a question must be answered together.

1. (a) Give the Boolean expression for the following logic diagram.

(3)

(b) State DeMorgan's law and prove it using truth table.

(3)

(c) Name the register:

  (i) Instruction from memory will be transferred to this register.

  (ii) The address part of the memory-reference instruction is transferred to this register.

  (iii) This register contains the address of next instruction that will be executed. (3)

(d) What is a register-reference instruction? Give any two examples. Name the addressing mode used by these instructions? (3)

(e) Perform the arithmetic operation $(-5) + (-6)$ in binary using 2's complement and 4-bit register. Show if there is any overflow. (3)

(f) (i) Find 8's complement of $(542)_8$.

  (ii) Subtract $(0100\ 1011)_2$ from $(0110\ 0110)_2$. (3)

(g) Write the microinstructions for fetch and decode phase of the instruction cycle along with control signals. (4)

(h) Briefly explain the working of encoder? How is it different from decoder? (4)

(i) Explain control command, status command, data input command, data output command in relation to I/O communication. (4)

2. (a) Draw the logic diagram of a 8-to-1 line multiplexer. Explain its working with the help of function table. (4)

(b) Simplify the following Boolean function F, together with the don't-care condition d in SOP form and draw the logic diagram for the simplified F.

$F(A, B, C, D) = \Sigma(4, 5, 7, 12, 13, 14)$

$d(A, B, C, D) = \Sigma(1, 9, 11, 15)$ (5)

(c) An instruction at address 021 in the basic computer has 1=0, an operation code specifying the AND operation, and an address part equal to 083 (all numbers are in hexadecimal). The memory word at address 083 contains the operand B8F2 and the content of AC is A937. Go over the instruction cycle and determine the contents of the following registers: PC, AR, DR, AC and IR at the end of each timing signal starting from T_0 to the end of execute cycle. (6)
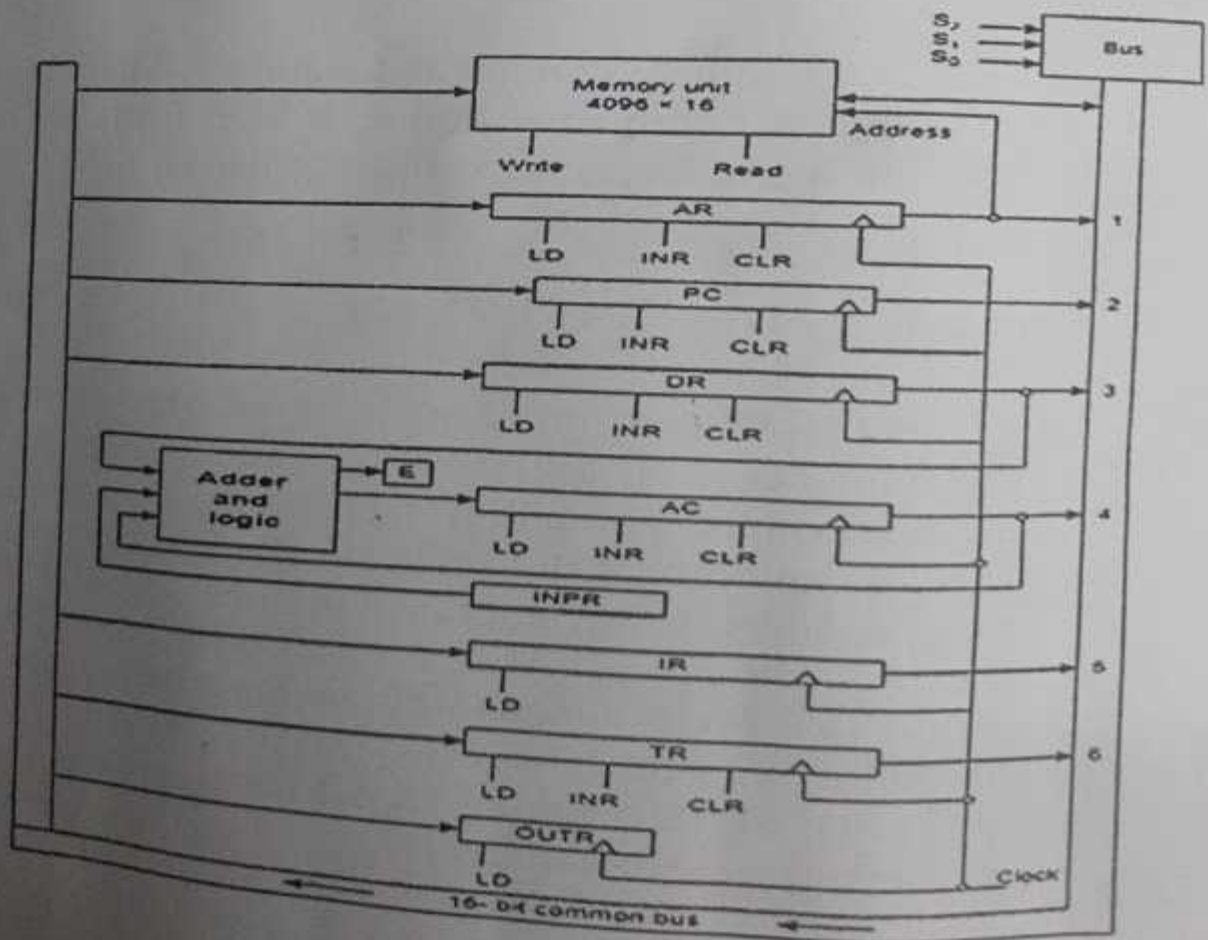
4

3. (a) Perform the following conversions :

   (i) Convert the decimal number 245.25 to hexadecimal.

   (ii) Convert $(101101.11)_2$ to decimal. (4)

   (b) How many 2-to-4-line decoders will be used to construct a 4-to-16-line decoder? Give the block diagram of the same. (5)

   (c) Consider the bus system shown below : (6)

(i) The following control inputs are active in the given bus system

For each case, specify the register transfer that will be executed during the next clock transition.

S.No.	S₂	S₁	S₀	LD of register	Memory	Adder
a.	1	1	1	TR	Read	-
b.	0	1	0	AR	-	-
c.	1	0	0	DR	Write	-
d.	0	0	0	AC	Add	

(ii) Write the microinstruction to set the flip-flop R to 1 including the control conditions.

4. (a) Write the excitation tables for the JK flip flop. How can you derive D flip-flop from a JK flip-flop? Show with the help of a block diagram.

(4)

(b) The memory unit of a computer has 256K words of 32 bits each. The computer has an instruction format with four fields: an operation code field, a mode field to specify one of seven addressing modes, a register field to specify one of the 56 processor registers, and a memory address. Specify the instruction format and the number of bits in each field if the instruction is in one memory word.

(5)

(c) Assuming the time delay of the four segments in a pipeline are as follows :

$t_1 = 50$ ns, $t_2 = 30$ ns, $t_3 = 95$ ns, $t_4 = 45$ ns. The interface registers delay time $t_r = 5$ ns. How long

would it take to execute an instruction over 100 pairs of data in the pipeline? What will be the speedup ratio if the time taken to execute same instruction in a non-pipelined system is 300 ns.

(6)

5. (a) List any four characteristics of GPU.

(4)

(b) What is DMA? How cycle stealing is different from burst transfer.

(5)

(c) Draw the diagram of a 4-bit binary adder-subtractor. Explain its working with the help of an example.

(6)

6. (a) Specify the fourteen-bit control word for the basic computer that must be applied to the processor to implement the following micro-operation, given the operation code for the operations are as follows :

(i) $R_6 \leftarrow$ shr R_1

(ii) $R_3 \leftarrow R_1 + R_3$

Operation	OPCODE
ADD	00010
SHR	10000

(4)

(b) Assume that the following 8-bit registers R_1, R_2, R_3 and R_4, initially have the following unsigned values:

$R_1 = 1111\ 0011$, $R_2 = 1110\ 0011$, $R_3 = 0011\ 1010$, $R_4 = 1010\ 1010$

Determine the 8-bit values in each register after the execution of the following micro-operations in sequential manner:

$$T_1 : R_2 \leftarrow R_4 \wedge \overline{R_3}$$
$$T_2 : R_4 \leftarrow \left(R_3 \vee R_2\right) \wedge R_4 \tag{5}$$

(c) Consider the fragment of memory as shown below :

Address	Memory		Registers
600	Mode	ADD to AC	PC – 600
601	Address – 840		
602	Next Instruction		R1 – 904
.....	....		
840	850		XR –200
.....	....		
850	840		AC – 150
.....	....		
903	1052		BR – 160
904	1200		
.....	....		
1000	1080		
.....	....		
1040	1220		
.....	....		
1442	350		
.....	....		

Assume that all the addresses and register / memory contents are in decimal. A two-word instruction is stored at an address 600 with address part stored at address 601. The first word consists of a 'mode bit' and the op-code for *ADD to AC* machine instruction, whereas second word of the instruction contains the value 840. Further, the

content of memory at different addresses is as shown in the figure above. PC is a Program counter register with value 600, R1 is a general-purpose register with value 904, XR is an Index register with value 200. BR is the Base register with content 160. Determine the effective address and the content of AC register after the operation is performed for the following addressing modes:

(i) Direct Addressing

(ii) Indirect Addressing

(iii) Relative

(iv) Indexed

(v) Register Indirect

(vi) Base Register addressing. (6)

7. (a) What is cache memory? How is it different from auxiliary memory? (4)

(b) Given the Boolean function:

$$F(A, B, C) = A'B'C + AB'C' + A'BC + ABC'$$

(i) List the truth table of the function.

(ii) Simplify the algebraic expression.

(iii) Draw the logic diagram of the simplified expression using NAND gates only.

(5)

(c) Explain programmed I/O with the help of a flowchart. How is it different from Interrupt driven I/O? (6)

(500)

3 [This question paper contains 6 printed pages.]

Sr. No. of Question Paper : 1058   **D**

Unique Paper Code   : 2342011103

Name of the Paper   : Mathematics for Computing

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

Semester   : I

Duration : 3 Hours   Maximum Marks : 90

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.

2. The paper has **two** sections. **Section A** is compulsory. Each question is of **5** marks.

3. Attempt any **four** questions from **Section B**. Each question is of **15** marks.

Section A

1. (a) Write the following system of equations in matrix form. Reduce the augmented matrix into row echelon form.   (5)

P.T.O.

$$x_1 + 3x_2 + x_3 = 1$$

$$-4x_1 - 9x_2 + 2x_3 = -1$$

$$-3x_1 - 6x_3 = -3$$

(b) Define a convex set. Show if $C = \{x_2: 2x_1 + 3x_2 = 7\} \subset R^2$ is a convex set. (5)

(c) Show that the transformation defined by $T(x_1, x_2) = (2x_1 - 3x_2, x_1 + 4, 5x_2)$ is not linear. (5)

(d) Find the characteristic polynomial of the following matrix (5)

$$A = \begin{bmatrix} 1 & 0 & -1 \\ 1 & -3 & 0 \\ 4 & -13 & 1 \end{bmatrix}$$

(e) Let $a = -2\hat{i} + 3\hat{j} + 5\hat{k}$ and $b = \hat{i} + 2\hat{j} + 3\hat{k}$ be two vectors. Find the value of the dot product of these two vectors. (5)

(f) Determine whether or not the vectors $(4, 1, -2)$, $(-3, 0, 1)$ and $(1, -2, 1)$ form a basis of R^3. (5)

Section B

2. (a) For what values of λ and μ do the following system of equations is consistent. (7)

$$x + y + z = 6$$
$$x + 2y + 3z = 10$$
$$x + 2y + \lambda z = \mu$$

(b) Find the inverse of the following matrix using Gauss Jordan method. (8)

$$A = \begin{bmatrix} 1 & 2 & 1 \\ 2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$$

3. (a) Determine whether the system has a nonzero solution. (7)

$$x + 2y - 3z = 0$$
$$2x + 5y + 2z = 0$$
$$3x - y - 4z = 0$$

(b) Apply Gram Schmidt orthonormalization process to obtain an orthonormal basis for the subspace of R^4 generated by the vectors. $(1, 1, 0, 1), (1, -2, 0, 0),$ $(1, 0, -1, -2)$.

(8)

4. (a) Use the Cayley-Hamilton theorem to find

$$(A - 2I)(A - 3I) \text{ where } A = \begin{bmatrix} 4 & 2 \\ -1 & 1 \end{bmatrix}.$$

(7)

(b) What is a subspace? Let Y be the set of vectors in R^4 of the form $[a, 0, b, 0]$. Prove that Y is a subspace of R^4.

(8)

5. (a) Calculate the curl and divergence for the following vector field.

(7)

$$\vec{F} = x^3 y^2 \hat{i} + x^2 y^3 z^4 \hat{j} + x^2 z^2 \hat{k}$$

(b) What is a positive definite matrix? Is the following matrix positive definite?

(8)

$$A = \begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$$

6. (a) Let a = [1, 1, 0], b = [3, 2, 1] and c = [1, 0, 2],
   Find the angle between: a, b and b, c.   (3)

   (b) If $\phi(x,y,z) = 3x^2y - y^3z^2$, find $\nabla\phi$(gradϕ) at the
   point (1, −2, −1).   (4)

   (c) Diagonalize the matrix   (8)

   $$A = \begin{bmatrix} 2 & 0 & 0 \\ 1 & 4 & -1 \\ -2 & -4 & 4 \end{bmatrix}$$

7. (a) If V is an inner product space, then show that
   < v, au + bw > = a < v, u > + b < v, w > where
   a and b are scalars and v, u, w are vectors in
   V.
                                                             (7)

   (b) Suppose that three banks in a certain town are
   competing for investors. Currently, Bank A has
   40% of the investors, Bank B has 10%, and Bank
   C has the remaining 50%. Suppose the towns folk
   are tempted by various promotional campaigns to
   switch banks. Records show that each year Bank
   A keeps half of its investors, with the remainder

switching equally to Banks B and C. However, Bank B keeps two-thirds of its investors, with the remainder switching equally to Banks A and C. Finally, Bank C keeps half of its investors, with the remainder switching equally to Banks A and B. Find the distribution of investors after two years. (8)

[This question paper contains 4 printed pages.]

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

Sr. No. of Question Paper : 1295

C

Unique Paper Code : 32343306

Name of the Paper : Web Design and Development

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

Semester : III

Duration : 2 Hours

Maximum Marks : 25

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.

2. The Question paper consists of **two** sections.

3. **Section A** is compulsory.

4. Attempt any **three** questions from **Section B**.

SECTION A

1. (a) Differentiate between GET and POST method?

(2)

(b) What are container tags? Explain with examples?

(2)

P.T.O.

(c) Explain printr statement and foreach loop?   (2)

(d) Name the tag to use CSS externally. Give syntax for the same.   (2)

(e) Give the output of the following code :   (1)

```
<?php

echo "The test string is 'No problem'.<br>";

?>
```

(f) Explain a Query String with the help of an example.   (1)

SECTION B

2. (a) Write the HTML code to create the following nested list on a web-page :   (3)

- Coffee
    a. Latte
    b. Cappuccino
- Tea
    a. Black tea
    b. Green tea
- Milk

(b) Describe the different types of selectors in CSS.

(2)

3. (a) Write a program in PHP to print the factorial of a given number.

(3)

(b) What is the Box Model in CSS?

(2)

4. (a) What will be the output of the following code :

```
<script type="text/javascript" language="javascript">
var x=12;
var y=8;
var res=eval("x+y");
document.write(res);
</script>
```

(3)

(b) Write the code in HTML to make an image as a hyperlink.

(2)

5. (a) Write a program in JavaScript to find the largest of three numbers. Accept the numbers as input from the user.

(3)

(b) What is a session? Write a code to start a session and create a session variable.

(2)

6. Create an HTML form that displays two text boxes and two radio buttons. The first text box accepts a numeric value. Write a JavaScript code such that:

A. If the first radio button is checked, the second text box should display the double value of the number entered in the first text box.

B. If the second radio button is checked, the second text box should display the square of the number entered in the first text box.

(5)

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

Sr. No. of Question Paper : 1374   C

Unique Paper Code   : 32341301

Name of the Paper   : Data Structures

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

Semester   : III

Duration : 3 Hours   Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.

2. Question No. 1 of 35 marks is compulsory.

3. Attempt any **Four** questions from Q. No. 2 to Q. No. 7.

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

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

	0	1	2	3	4
	A	C			

Front (at 0)   Rear (at 1)
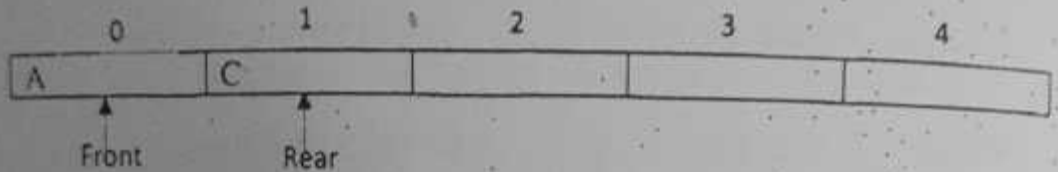
Show the contents of the queue with position of Front and Rear after each of the following operations done in sequence.

(i) Insert X

(ii) Remove two letters

(iii) Insert Y and Z

(iv) Insert W

(v) Remove one letter

(5)

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

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

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

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

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

Answer the following :

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

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

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

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

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

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

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

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

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

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

Show heap after each insertion. (5)

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

(i) Row major

(ii) Column major (5)

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

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

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

(5)

(4)

3. (a) Give Output.

(i) Consider the linked list:

6−>4−>3−>1−>2−>7−>NULL

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

```
Void fun1 (node *p)

{

    if(p==NULL)

        return;

    fun1(p->next->next);

    cout<< p->data+1;

}
```

(ii) Consider the linked list :

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

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

Void fun2(node *s)

```
{
    if(s==NULL)

        return;

    cout<< s->data;

    if(s->next!=NULL)

        fun2(s->next->next)

    cout<< s->data;

}
```

(b) Write functions for the following :

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

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

(6)

4. (a) Consider the following recursive function :

(5)

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

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

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

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

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

```
traverse(node *p)

    {
        if(p ! = 0)
        {
```

```
        traverse(p->left);

        traverse(p->right);

        visit(p);

        }

    }
```

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

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

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

     (i) insertFront(e)

     (ii) insertBack(e)

     (iii) deleteFront()

     (iv) deleteRear()

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

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

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

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

(6)

(b) Consider the following binary search tree (BST):
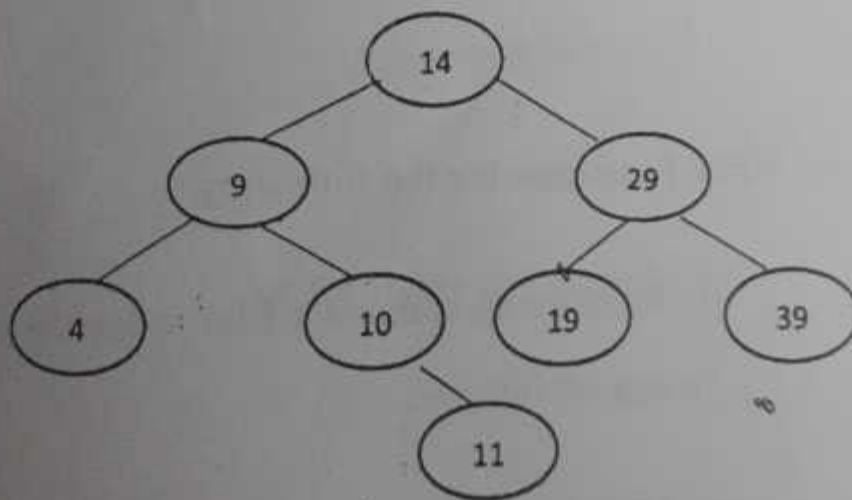
Apply two approaches 'deletion by merging' and 'deletion by copying' to delete the root node. Compare both the trees after deletion in terms of height.

(4)

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

Sr. No. of Question Paper : 1402   C

Unique Paper Code   : 32341303

Name of the Paper   : BHCS12 - Computer Networks

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

Semester   : III

Duration : 3 Hours   Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.

2. **Section A** is compulsory and carries **35** marks.

3. Attempt any four questions from **Section B**.

4. **All** questions carry equal marks.

SECTION A

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

P.T.O.

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

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

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

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

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

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

  (i) 127.0.0.0

  (ii) 255.255.255.255 (2)

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

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

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

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

(i) Number of bits per baud (r)

(ii) Baud rate (S) (2)

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

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

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

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

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

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

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

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

(2)

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

(i) Route determination

(ii) Interface to transmission media

(iii) Provides access to the end user

(3)

SECTION B

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

(a) Calculate its Hamming distance.

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

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

(3)

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

(3)

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

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

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

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

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

(a) 135.46.63.10

(b) 192.53.56.7

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

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

(a) Connection

(b) Sequence of Data packets at the receiver

(c) Acknowledgement of the received packets

(3)

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

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

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

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

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

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

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

(iii) Consider the IP address 184.86.92.182,

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

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

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

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

(1+2+2+1)

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

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

(iii) Consider the network shown below and assume that each node initially knows the costs to each of its neighbors. Consider the distance vector algorithm and show the distance table entries at node E. (4)
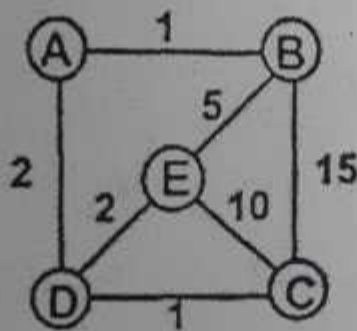
7. (i) Why is the header checksum of an IP packet computed at every hop from source to destination? (2)

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

(iii) State Optimality Principle. (3)

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

(1500)

[This question paper contains 8 printed pages.]

Sr. No. of Question Paper : 1402   C

Unique Paper Code   : 32341302

Name of the Paper   : Operating Systems

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

Semester   : III

Duration : 3 Hours   Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.

2. **Section A** is compulsory. Attempt any 4 questions from **Section B**.

3. Parts of a question must be answered together.

SECTION A

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

                                                 (1)

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

                                                 (1)

P.T.O.

2

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

(2)

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

(2)

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

(2)

(vi) How degree of multiprogramming affects CPU performance?

(2)

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

(2)

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

(2)

(ix) List any two privileged instructions?

(2)

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

(2)

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

(2)

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

(xiii) Determine whether the deadlock occur in the given resource 3 allocation graph of three processes as P_1, P_2 and P_3 and four resources as R_1 (one instance), R_2 (two instance), R_3 (one instance) and R_4 (3 instances)? Justify your answer. (3)
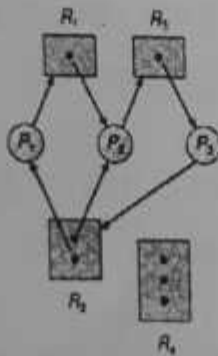
(xiv) How many child processes are created in the following fragment of code assuming essential header files are included? Explain the output with justification.

```
int main()
{
    for (int i=0;i<4;i++)
        fork();
    return 0;
}
```
(1+2)

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

(3)

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

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

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

(2+2)

SECTION B

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

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

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

(3)

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

(3)

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

(4)

3.   (i) Differentiate the following :

(a) Long term schedular and Short term schedular

(b) Asymmetric multiprocessing and Symmetric multiprocessing

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

(ii) Consider the following page reference string :

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

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

(a) Optimal replacement

(b) FIFO replacement (4)

4. (i) Consider the following segment table :

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

What are the physical addresses for the following logical addresses?

(a) 0, 230

(b) 1, 10

(c) 2, 300

(d) 3, 400

(e) 4, 200

(5)

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

(a) Effective memory access with TLB

(b) Effective memory access without TLB

(3)

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

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

(4)

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

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

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

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

(a) Shortest seek time first (SSTF)

(b) Circular SCAN (C-SCAN)

Give all the intermediate calculations.

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

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

    (b) Data parallelism and Task parallelism

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

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

(1500)

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

Sr. No. of Question Paper : 1006   C

Unique Paper Code   : 32341501

Name of the Paper   : Internet Technologies

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

Semester   : V

Duration : 3 Hours   Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.

2. **Section A** is compulsory.

3. Attempt any **FOUR** questions from **Section B**.

SECTION A

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

   - ipconfig

   - tracert   (4)

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

(4)

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

(4)

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

(4)

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

(4)

(f) Given the JSON object:

(2)

myJson = { "name" : "nested",

"marks" : 45,

"Item" : ["food", "clothes", {"a" : true}]

}

Write the value of a.

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

(3)

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

(3)

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

(i) 255.255.255.192

(ii) 255.255.255.224

(iii) 255.255.255.240

(iv) 255.255.255.248   (2)

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

(3)

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

SECTION B

2. Write short notes on following :   (10)

(i) Crawling

(ii) Indexing

(iii) Internet Protocols

(iv) Internet Vs. Intranet

(v) Domain Name Server

3. Given the list :

(10)

- John

- Merry

- Martian

- Ketty

Write statements using JQuery to perform the following functions :

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

- Mat

- John

- Merry

- Martian

- Ketty

- Damon

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

- Mat Jonas

- John Mathew

- Merry lane

- Martian steven

- KettyGadot

- Damon Hartley

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

(iv) Give a background color to the list.

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

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

(5)

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

(5)

5. (a) Explain following Bootstrap elements :

(5)

- Pagination

- List Groups

- Panels

- Navbar

- Dropdowns

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

(5)

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

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

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

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

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

Sr. No. of Question Paper : 1042

C

Unique Paper Code : 32341502

Name of the Paper : Theory of Computation

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

Semester : V (Admissions 2019-2021)

Duration : 3 Hours
Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.

2. Question No. **1 (Section A)** is compulsory.

3. Attempt any **four** Questions from Nos. **2** to **7** (Section B).

4. Parts of a question must be answered together.

5. Consider $\Sigma = \{a, b\}$ for all the questions unless specified otherwise.

SECTION A

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

P.T.O.

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

S -> SAbAbAbA | λ

A -> aA | λ

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

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

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

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

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

    (i) bba*b

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

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

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

(f) Describe the language accepted by following finite automaton :   (2)
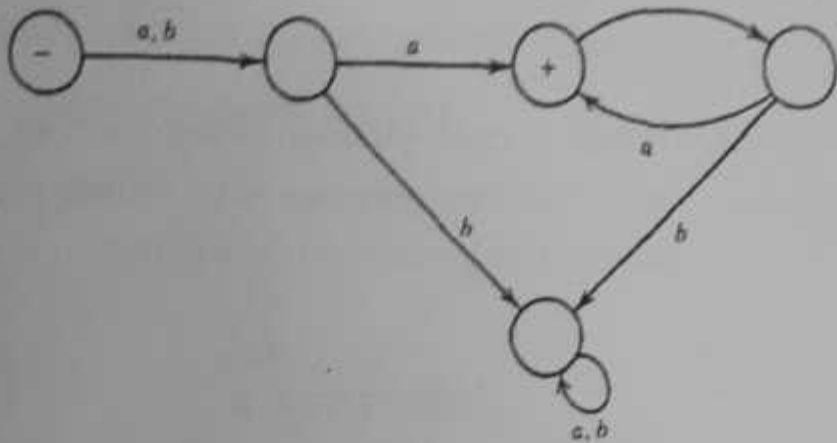
(h) Using pumping lemma, show that the following language is a non-regular language :   (4)

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

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

     (4)

(j) Construct the context free grammar (CFG) for the language accepted by following finite automaton :   (3)
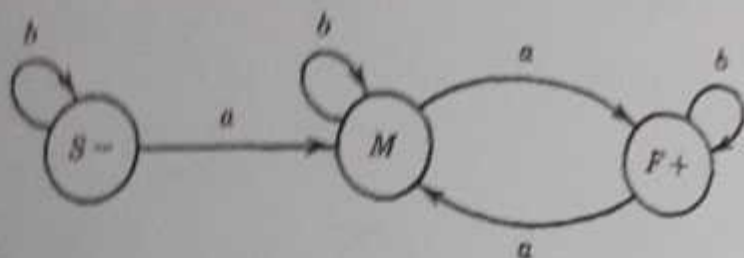
(k) Design a right shifting hiring machine. Assume the initial configuration to be ▷⊔w⊔ and desired output configuration to be ▷⊔⊔w⊔.   (4)

SECTION B

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

    (b) Convert the following non-deterministic finite automaton to deterministic finite automaton: (4)
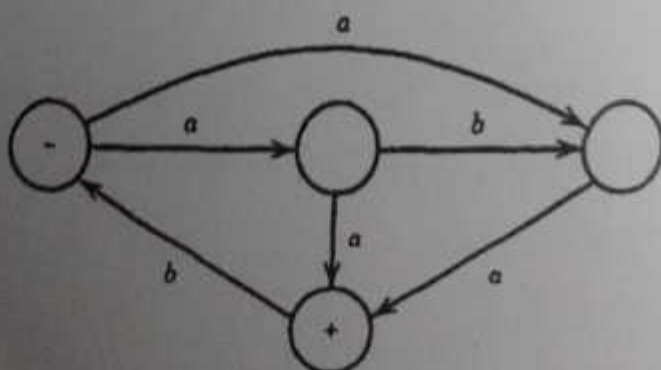
3. (a) For the following pairs of FAs, build a finite
automaton that accepts the intersection of
languages defined by FA1 and FA2. Also, build a
finite automaton that accepts the complement of
the language defined by FA1. (6)
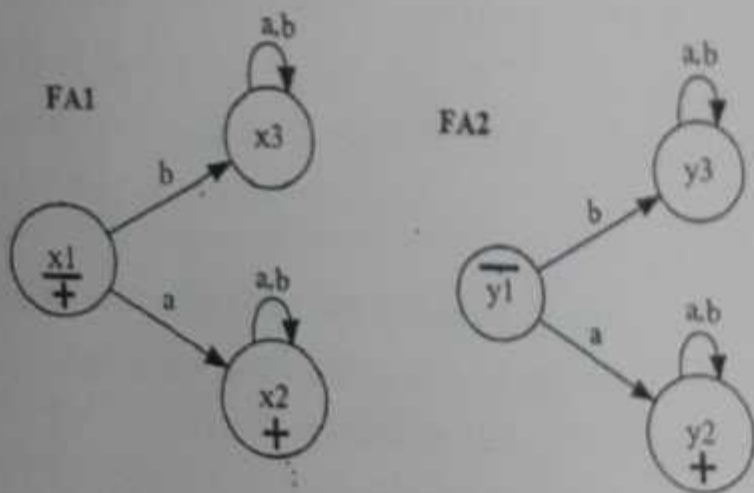
(b) Show that the set of regular languages are closed
under union and kleene closure using non-
deterministic finite automata. (4)

4. (a) Using the bypass theorem, convert the following
transition graph into a regular expression : (6)
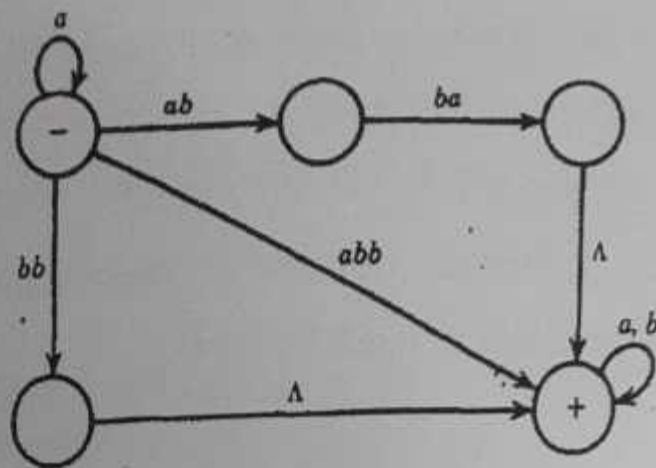
(b) Use pumping lemma to prove that the language $\{a^n b^n c^n$ where $n = 1, 2, 3, 4, 5....\}$ is non-context free language. (4)

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

(i) Describe the language accepted by it.

(ii) Is the given PDA deterministic or non-deterministic? (4)
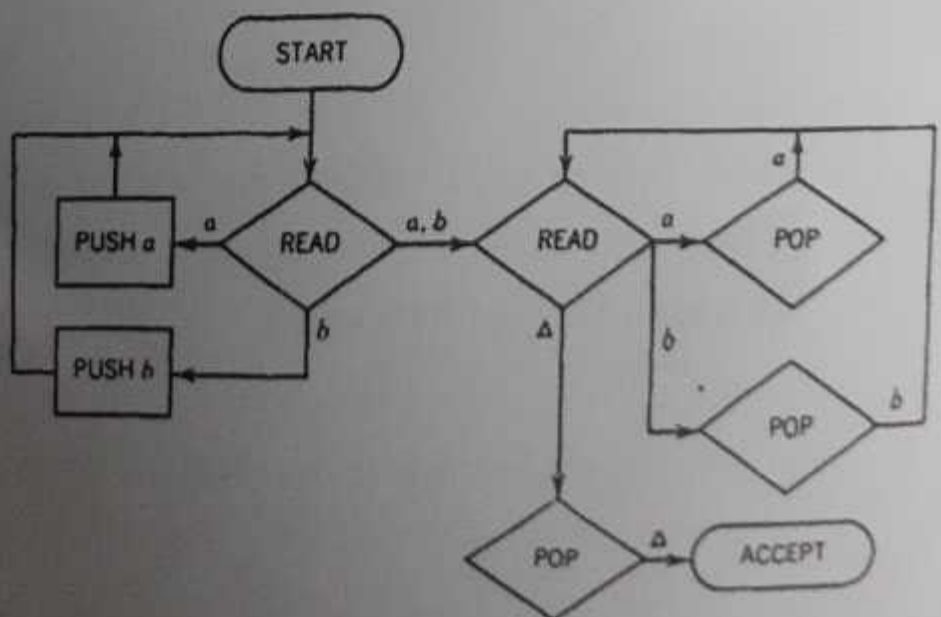
(b) Construct a PDA for the language $a^n b^q a^m$ where m, n >= 1 and q = m+n. (6)

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

S -> AbB

A -> aA| λ

B -> aB | bB| λ

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

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

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

S -> XaXaX

X -> aX | bX | λ

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

initial configuration to be $\triangleright \sqcup w$ (if the input is $\triangleright \sqcup w$, the output should be $\triangleright \sqcup w'$, where w' is the one's complement of w). Show the trace of above turing machine M on the string $\triangleright \sqcup 0110$.

(5)

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

(2)

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

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

Give the representation of Universal Turing machine for M.

(3)

Sr. No. of Question Paper : 1096   C

Unique Paper Code   : 32347508

Name of the Paper   : Combinatorial Optimization

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

Semester   : V

Duration : 3 Hours   Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.

2. All parts of Question 1 (**Part A**) are compulsory.

3. Attempt any **four** questions from **Part B**.

4. All questions in **Part B** carry equal marks.

Section A

1. (a) Differentiate between a Linear Program and an Integer Program with the help of an example.

(2)

(b) How is infeasible solution detected in the simplex method?

(3)

(c) 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. Now construct G' as the same graph as G and with capacity $c'(e) = 2*c(e)$ (for each edge e). Now consider the cut (S, T) for G'. Is (S, T) a minimum cut for G'? Explain with an example.

(3)

(d) Prove that a feasible solution x of a linear program in equational form is basic if and only if columns of matrix A_K are linearly independent where $K = \{j \in \{1,2,..., n\}: x_j > 0\}$

(4)

(e) Convert the following linear program into equational form:

(4)

Maximize $\quad 4x_1 - 2x_2$

Subject to $\quad x_1 - x_2 \le 4$

$$x_1 + 2x_2 \ge 5$$

$$x_2 \ge 0, x_1 \text{ unrestricted}$$

(f) Define convex set. Prove that the intersection of arbitrary collection of convex set is convex.

(4)

(g) An oil company has two depots A and B with capacities of 7000L and 4000L respectively. The company is to supply oil to three petrol pumps D, 'E and F whose requirements are 4500L, 3000L and 3500L respectively. The distance (in kilometres) between the depots and the petrol pump is given in the following table :

| From/To | Distance in Km. | |
	A	B
D	7	3
E	6	4
F	3	2

Assuming that the transportation cost of 10L of oil is rupees 1 per kilometre how should the delivery be scheduled in order that transportation cost is minimum? Formulate the above problem as linear program.

(5)

(h) Write the dual of following linear programming problem
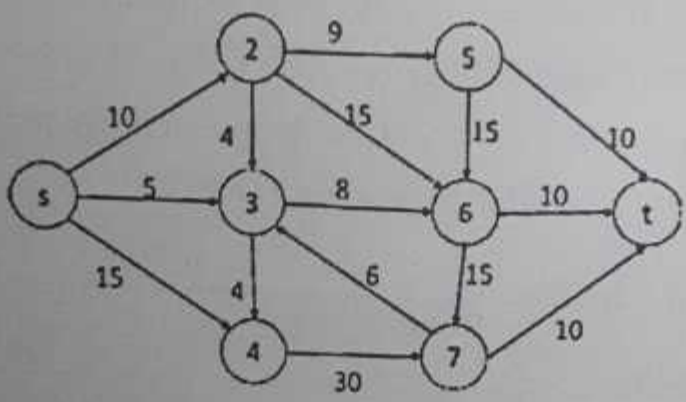
Maximize $\quad Z = 3X_1 + 2X_2 + 3X_3$

Subject to $\quad 2X_1 + X_2 + X_3 = 2$

$$X_1 + 3X_2 + X_3 \geq 6$$

$$3X_1 + 4X_2 + 2X_3 \leq 8$$

$$X_1, X_2, X_3 \geq 0$$

(5)

(i) Delete the best set of edges to disconnect t from s, where best set is defined as the set of edges with total minimum capacity.

(5)

Section B

2. (a) State min-cut and max-flow theorem.

(3)

(b) A network has edges with distances as shown in the following table

	S	A	B	C	D	E	T
S	-	40	40	-	-	-	-
A	40	-	-	-	15	20	-
B	40	-	-	45	10	-	-
C	-	-	45	-	15	-	50
D	-	15	10	15	-	10	15
E	-	20	-	-	10	-	25
T	-	-	-	50	15	25	-

The letters refer to nodes in the network. Find the shortest path from S to each node using Djikstra's algorithm.

(7)

3. Solve the following Linear Programming problem using 2-phase simplex method. (10)
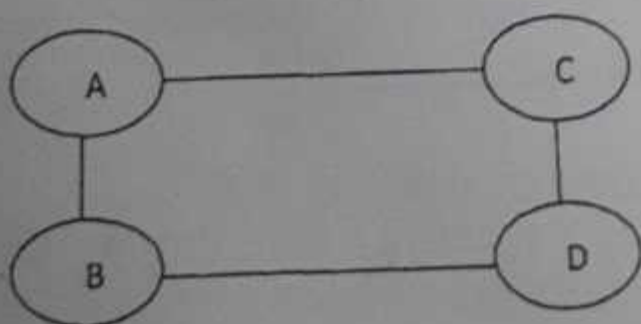
Maximize $Z = 2X_1 + 2X_2 + 4X_3$

Subject to

$$2X_1 + X_2 + X_3 <= 2$$
$$3X_1 + 4X_2 + 2X_3 >= 8$$
$$X_1, X_2, X_3 \geq 0$$

4. (a) Formulate an Integer Program to determine a maximum independent set of the following graph. State LP relaxation condition also.

(5)

(b) An LP has been solved in the standard form and the following optimal solution for the primal and dual problems have been determined. The complementary pairs have been listed next to each other.

Primal	$x_1 : 10$	$x_2 : ?$	$x_3 : ?$	$x_4 : 5$	$x_5 : 4$	$x_6 : ?$
Dual	$y_4 : ?$	$y_5 : 5$	$y_6 : ?$	$y_1 : 0$	$y_2 : 0$	$y_3 : 2$

The Primal objective is given by x_3 and the Dual objective is given by $y_1 + y_2 + 2y_3$. Which of the following statements regarding the missing parts in the table are correct?

(i) $y_4 = 0$

(ii) $x_2 = 0$

(iii) x_3 may or may not be zero. We do not have sufficient data to conclude.

(iv) $x_6 = 0$

(v) $x_3 = 4$

(5)

5. (a) Can the dual of an unbounded primal LP be unbounded? Explain.

(3)

(b) Consider the following LPP:

$$\text{Min } Z = 3X_1 + 8X_2$$

S.T.

$$X_1 + X_2 \geq 8$$
$$2X_1 - 3X_2 \leq 0$$
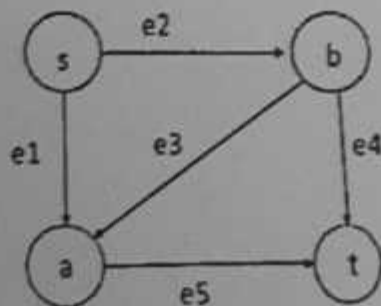$$X_1 + 2X_2 \leq 30$$
$$3X_1 - X_2 \geq 0$$
$$X_1 \leq 10$$
$$X_2 \geq 9$$
$$X_1, X_2 \geq 0$$

Solve the above LPP graphically and find the optimal solution using the method of iso-profit line method.

(7)

6. (a) Consider the following flow graph. Let the capacity and current flow of edge e be denoted by $c(e)$ and $f(e)$ respectively. Further, let $c(e_1)=5$, $f(e_1)=2$, $c(e_2)=3$, $f(e_2)=2$, $c(e_3)=2$, $f(e_3)=0$, $c(e_4)=4$, $f(e_4)=2$, $c(e_5)=2$, $f(e_5)=2$. Determine the max flow and min cut.

(5)

(b) For the following LP, prove or disprove that $x = [1,1,1]^T$ is an optimal solution by using the complementary slackness conditions.

Min $-5x_1 - 4x_2 - 3x_3$

Subject to $2x_1 + 3x_2 + 1x_3 \geq 5$

$$4x_1 + 1x_2 + 2x_3 \leq 13$$

$$3x_1 + 4x_2 + 2x_3 = 9$$

$$x_1, x_2, x_3 \geq 0$$

(5)

7. (a) Consider the fractional solution for maximum weight matching given below : $X_{AP}=0.9$, $X_{AR}=0.1$, $X_{BQ}=0.3$, $X_{BS}=0.7$, $X_{CQ}=0.7$, $X_{CS}=0.3$, $X_{DP}=0.1$, $X_{DR}=0.9$. 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 the above LP? Justify your answer. (5)
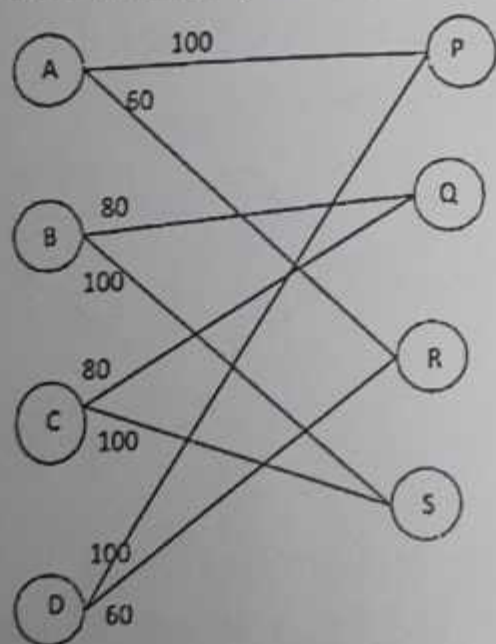
(b) Let P be the set of all feasible solutions of a linear program in equational form, Then, show that the following two conditions for a point $v \in P$ are equivalent :

   (a) v is a vertex of the polyhedron P.

   (b) v is a basic feasible solution of the linear program. (5)

(1500)

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

Sr. No. of Question Paper : 1020   D

Unique Paper Code   : 2342011101

Name of the Paper   : Programming using Python (DSC-1)

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

Semester   : I

Duration : 3 Hours   Maximum Marks : 90

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.

2. **Section A** is compulsory.

3. Attempt any 4 questions from **Section B**.

4. Parts of a question must be answered together.

SECTION A

(Compulsory)

1.   (a) What is an algorithm? Write an algorithm to solve the quadratic equation.

                                                                          (4)

(b) Write a function checkPrime(n) to check whether the given number n is prime or not. The function should return 1 if the number n is prime else 0. Call this function in main( ) to check the number input by the user.

(4)

(c) Evaluate the following expressions: (4)

(i) 9+3*2**2 != 9//4-2 and 'hello' >= 'Hello world'

(ii) 20 ^ -22 & -5

(d) Consider the dictionary **groupDict** representing student details of a group. (4)

groupDict is defined as follows :

groupDict = {'group': {

       'student': { 'name': 'Mike',

       'marks': { 'physics': 70, 'history': 80 }

       }

       },

       'section': 'A'

}

Write the python code snippets for the following operations :

(i) Access the value of the subject **Chemistry**.

(ii) Extract the value of the key **group**, and use the default value as -1 if key is not found.

(iii) Create a copy of a **groupDict** into a dictionary object **newGroup**.

(iv) print the dictionary **newGroup** after removing the element with the key **section**.

(e) Define a class Rectangle having the following structure: (6)

Attributes: length, breadth

Methods: _init_ ( ) for initializing the attributes.

getLength() which returns the length of the rectangle.

perimeter( ) which returns the perimeter of the rectangle.

(f) Find the output for the following python scripts: (8)

(i) myString = 'Hello Everyone,Welcome to the session!

```
print(myString [len(myString) :: -1])
print(myString [:-15] + myString [-15:])
print(myString.partition('Welcome'))
print(myString.rfind('to'))
```

(ii) X = ['Red', 'Blue', 'Green']

```
Y = ['Yellow','White']
X.extend(Y)
X.append(23)
X.pop()
X.remove('Yellow')
print(X)
print(Y)
```

(iii) try:

```
    num = 8
    print(num + 'hello')
    print(num / 4)
except ZeroDivisionError:
    print('Divided by zero')
except(ValueError,TypeError):
    print('Error occurred')
finally:
    print('Stop')
```

(iv) monthDays = {'Januray': 31, 'February': 28, 'March': 31}

    Month = monthDays

    Month['February'] += 1

    print('monthDays before clear-->', monthDays)

    print('Month before clear-->', Month)

    Month.clear()

    print('monthDays after clear-->', monthDays)

    print('Month after clear-->', Month)

SECTION B

2. (a) Write a program that accepts x and n as input to compute the following series.   (6)

$$x - \frac{x^2}{2!} + \frac{x^3}{3!} - \frac{x^4}{4!} + \cdots \text{ n terms}$$

(b) Consider the following code snippet   (9)

```
for k in 'Computer Science':
    if k = 'e':
        S1
        print(k, end = ", ")
```

Compare the output when S1 is replaced with each of the following statements:

(i) break

(ii) continue

(iii) pass

3. (a) Consider the following tuples

(6)

T1 = (100, 200, 300)

T2 = ('Monday', 'Tuesday', 'Wednesday')

(i) Write a function swapTuple(T1, T2) to swap the values of T1 and T2.

The expected output is as follows:

T1 = ('Monday', 'Tuesday', 'Wednesday')

T2 = (100, 200, 300)

(ii) Write a function mergeTuple(T1, T2) to return a list of tuples containing the corresponding element from tuples T1 and T2. The expected output is as follows :

T3 = [('Monday', 100), ('Tuesday', 200), ('Wednesday', 300)]

(b) Consider list L1 as follows :

(9)

$$L1 = [100, 200, 300, [400,500]]$$

Write code snippets to create the following lists :

(i) L2 as a shallow copy of L1

(ii) L3 as a deep copy of L1.

Demonstrate the effect of the following modifications in L1, L2 and L3:

(i) L1[2] = 900

(ii) L1[3][0] = 700

4. (a) Write a function doubleDict() that creates the dictionary Dict1 where the keys are numbers between 1 and 5 and values are twice the keys. For example: if the key is 5, its value is 10. The function should return the dictionary Dict1.

Write a program that calls doubleDict( ) and prints the values of the following operations when applied to the Dict1.

(i) maximum key

(ii) sum of keys

(7)

(b) Consider two lists Lst1 and Lst2 declared as follows : (8)

Lst1 = ['green', 'blue']

Lst2 = ['blue', 'yellow']

Write a python script to do the following :

(i) Convert list Lst1 as set S1 and Lst2 as set S2.

(ii) Add the elements of the list ['black', 'cyan'] to S2.

(iii) Find the symmetric difference between sets S1 and S2.

(iv) Create a set newSet using set comprehension containing elements of S1 with 's' added at the end of each element. The newSet should appear as:

newSet = {'blues', 'greens'}

5. (a) Consider the function percentage(marks, total) that computes the percentage of marks for a student. (6)

```
def percentage (marks, total):
    try:
        percent = (marks/total) * 100
    except ValueError:
        print('Value Error')
    except TypeError:
        print('Type Error')
    except ZeroDivisionError:
        print('Zero Division Error')
    except:
        print('Any other error')
    else:
        print(percent)
    finally:
        print('Completed!')
```

Explain the output corresponding to the following function calls.

(i) percentage (17.0, 20.0)

(ii) percentage (19.0, 0.0)

(iii) percentage ('200.0', 200.0)

(b) Define the following functions to perform the operations on a string.

(9)

(i) countVowel(Str1) to count the vowels in a string.

(ii) replaceChar(Str1) to replace all occurrence of the character 'a' with a space.

(iii) reverseString(Str1) to reverse a string

Write a program to call these functions and provide the output for the given string Str1.

Str1 = 'Happiness depends upon ourselves!'

6. (a) Find the error(s) in the following code snippets:

(i) file1 = open('Myfile', 'w')   (3)

file1.read()

file1.close()

(ii) tuple1 = (2120, 'abc')

del tuple1[0]

(b) Explain the type of exception raised in the following statements: (4)

(i) x=0

print(5/x)

(ii) print('The amount for the day is :' + 300)

(iii) int('Morning')

(iv) L1 = [11,22,33,44,55]

print(L1[5])

(c) Describe the following methods for the class objects with suitable examples. (8)

(i) __init__

(ii) __str__

(iii) __del__

(iv) __main__

7. (a) Write a function sumDigits(Num) which computes the sum of digits of a number Num and returns it.

(5)

(b) Write a program to read a file myFile and perform the following operations: (10)

   (i) print the total number of lines in the file.

   (ii) copy even lines of the file to a file named evenFile and odd lines to another file named oddFile.

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

Sr. No. of Question Paper : 1193   C

Unique Paper Code   : 32347504

Name of the Paper   : Microprocessor

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

Semester   : V

Duration : 3 Hours   Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.

2. Attempt **all** questions from **Section-A**.

3. Attempt any **four** questions from **Section-B**.

4. Attempt all parts of a question together.

SECTION A

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

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

(c) Are the following instructions valid?

    (i) PUSH 1234H

    (ii) MOV DS, AX

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

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

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

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

(e) Explain the following instructions –

    (i) OUTSW

    (ii) INSD (3)

3

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

(g) Explain BOUND interrupt instruction.

(2)

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

(3)

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

(3)

    (i) If the distance is 0160H bytes

    (ii) If the distance is 10000H bytes

(j) If direction bit D is 0, DI = 01FFH, SI = 0100H,

then what will be the value of SI and DI after execution of MOVSD instruction? Explain.

(3)

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

(i) CLK

(ii) PCLK

(iii) OSC
(3)

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

SECTION B

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

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

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

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

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

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

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

   (b) Differentiate between NMI pin and INTR pin.

   (3)

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

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

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

   (i) CWD

   (ii) DAA (5)

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

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

(i) MOV ECX, [BP – 200H]

(ii) MOV DL, [BP + SI – 10H]

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

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

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

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

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

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

(i) LOCK

(ii) HOLD

(iii) ALE

(iv) Status pins S3, S4

(5)

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

(3)

(c) Explain Branch Prediction Logic of Pentium microprocessor.

(2)

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

(i) SUBTRACT DI from SI

(ii) OR 88H with ECX

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

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

(v) ADD the data addressed by SI to AL

(5)

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

(5)

(1500)

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

Sr. No. of Question Paper : 1127   D

Unique Paper Code   : 2342571101

Name of the Paper   : Programming Fundamentals
                             Using C++

Name of the Course   : B.Sc. (Multidisciplinary
                             Courses of Study with Three
                             Core Disciplines under
                             UGCF 2022)

Semester   : First (I)

Duration : 3 Hours   Maximum Marks : 90

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt
   of this question paper.

2. **Section A** is compulsory.

3. Answer any **four** questions from **Section B**.

4. Parts of a question must be answered together.

5. Write program statements in C++ language.

P.T.O.

Section A

1. (a) Which of the following is a valid identifier in C+
   Give reason.

   (i) protected

   (ii) 8years

   (iii) _myname

   (b) Write an assignment statement using a sing
   conditional expression for the following co
   segment:

   if (marks>=80)

   grade= 'A';

   else

   grade='B';

   (c) Give the output of the following code segment

   int main()

   {

   int n=6;

   if(n=10)

```
        cout<< "n is zero"<<endl;
    else
        cout<< "n is not zero"<<endl;
        cout<<"The cube of n is"<<n*n*n<<endl;
}
```

(d) What will be result of the following expressions in
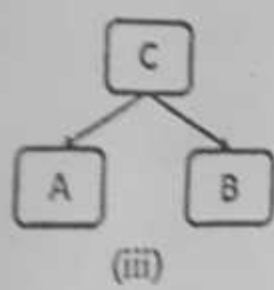C++ : (3)

(i) 56! =90&&56<100

(ii) 20<<2

(iii) a=20;
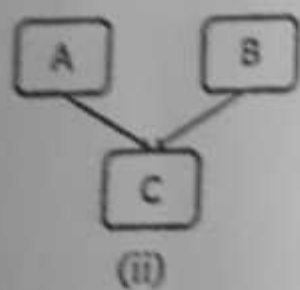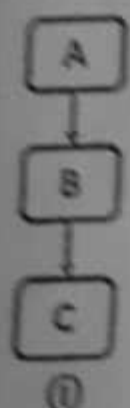b=a++ + 5;
cout<<b;

(e) Give the output of the following code segment: (3)

```
int main()
{ int x = 10; //assume the address of x is 1500
  int *y;
  y=&x;
  cout<<*y<<endl ;
  cout<<y<<endl;
  cout<<*(&x);
  return 0;
}
```

(f) Write C++ code to calculate the square number using inline function.

(g) List any three properties of destructor functi

(h) Identify the type of inheritance in the follow cases :

(i)   (ii)   (iii)

(i) Identify the error in the following try-catch bl and give the correct code.

```
try{
    // try block
}catch( ... ) {
    // catch block 1
}catch( int ) {
    //catch block 2
}catch( char ) {
    //catch block 3
}catch( double ) {
    //catch block 4
}
```

(j) State if the following statements are True or False : (3)

(i) Class members are by default public.

(ii) A constructor never has arguments.

(iii) If a file is opened for writing in ios::out mode and the file by that name already exists then the contents of the file are deleted.

Section B

(a) Write a C++ function to accept a three digit number as parameter and returns the sum of its digits. For example, if the number is 435 then the function should return 12. (5)

(b) Find the error, if any in the following C++ statements: (5)

(i) cout<<"x=" x;

(ii) int m==10;

(iii) cin>>x;>>y;

(iv) int func(int a=1, int b);

(v) cout<<\n "Name: "<<name;

(c) Write a function average (int count, int marks where count indicates total number of student the class and marks [] refers to the marks obtai by these students. The goal of the function i return the average marks of the class.

3. (a) Write a C++ program to display the follow pattern on the output screen. Take the numbe rows from the user as an input. For example the number of rows entered is 4 then the follow output should come.

44444

33333

22222

11111

(b) Consider the following code segment in C++:

```
switch(ch)
{
    case 'A': cout<<"Variable has value A" << "\n";
    case 'B': cout<<" Variable has value B" << "\n";
```

case 'C': cout<<" Variable has value C" << "\n";

break;

default: cout<<"Variable has some other value"<<"\n";

}

Find the output of the above code using following values of variable ch :

    (i) ch = 'B'

    (ii) ch = 'E'

    (iii) ch = 'a'

    (iv) ch = 'C'

(c) Distinguish between entry-control and exit-control loop with suitable example.

(5)

4. (a) Write a program to compute the area of triangle and a circle using the concept of function overloading.

(5)

(b) Consider the following function :

(5)

int Multiple(int a, int b=0,int c=1){

    return (a*b*c);

}

What will be the value of result when the following function calls are made:

(i) result=Multiple(2,3,4);

(ii) result=Multiple (2,3);

(iii) result=Multiple (2);

(iv) result=Multiple (1,3.8);

(v) result=Multiple (4.5);

(c) Explain the concept of call by value and call by reference. Write a function to swap two numbers using appropriate calling method. (5)

5. (a) Write a C++ program to copy the contents of one text file to another file. (5)

(b) Add try-catch blocks in the following code at appropriate position : (5)

```
#include<iostream>
using namespace std;
void divide(int x, int y, int z) {
    if(x-y)1=0)
    {
```

```
        int r = z/(x-y);
        cout<<"Result="<<r;
    }
    else
    {
        throw (x-y);
    }
}
int main() {
    divide(10, 20, 30);
    divide(10, 10, 30);
    return 0;
}
```

(c) When do we declare the data member of a class as static? State any two properties of a static member variable of a class. Also state any two properties of a static member function. (5)

6. (a) Write a program to create a class TwoDim which has x and y integer coordinates as data members. Write the following member functions for this class : (5)

   – A parameterized constructor to initialize the data members x and y, with y having default value 5.

– A function print () to print the coordinate values in the form (x, y), i.e. for x=4 and y=5, the output of print should be (4, 5).

In the main (), create an object ptl of the class TwoDim with values 4 and 5, and display this point.

(b) Consider the following C++ program and find the final output. (5)

```cpp
#include <iostream>
using namespace std;
int main ()
{ int a[] = {1, 2, 3, 4, 5, 6, 7, 8};
  int *p;
  p = a;
  cout<<" \nValue at p: "<< *p<<endl;
  p=p+2;
  cout<<" \nValue at p+2 "<< *p<<endl;
  ++p;
  cout<<"\nValue at ++p "<< *p<<endl;
  cout<<"\nValue at p-- "<< *(p--) <<endl;
  return 0;
}
```

(c) Explain the file opening modes ios: : ate, ios: : app and ios: : out.

Name two file pointers used to move through the files while reading and writing. (5)

7. (a) Convert the following C++ program to incorporate the use of template in Test class. (5)

```cpp
#include<iostream>
using namespace std;
class Test {
        int a;
        int b;
    public:
        Test(int n1, int n2) {
            a = n1;
            b = n2;
        }
        void show( );
};
void Test::show( ){
    cout<<a<<"and"<<b;
}
int main() {
    Test testl(123, 20);
    testl.show( );
    return 0;
}
```

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(b) Write the sequence of constructors and destructors being called in the following inheritance: (5)

class A{...};

class B: public A{...};

class C: public B{...};

class D{...};

class E: public D, public C{...};

E obj;

(c) What are virtual and pure virtual functions? What is a class containing at least one pure virtual function called? Explain the need of virtual functions with the help of an appropriate example.

(5)

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

D

Sr. No. of Question Paper : 1133

Unique Paper Code : 2342571101

Name of the Paper : Programming Fundamentals Using C++

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

Semester / Year : I / 2022

Duration : 3 Hours   Maximum Marks : 90

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.

2. Paper has **two** sections. All the questions in **Section A** are compulsory.

3. Answer any **four** questions from **Section B**.

Section A

1. (a) How are comments inserted in a C++ program? Explain with suitable example.

(2)

P.T.O.

(b) What is the meaning of void in the following function declaration statement?

void myfun(void);

(2)

(c) Find the error(s) if any, in the following statements and correct them.

long float x;
int marks=three;
int &number=100;
int public=400;

(4)

(d) Explain any three data types used in C++ with suitable example.

(6)

(e) Explain with examples different access specifiers used in a class in C++.

(4)

(f) What will be the value of e after executing the following code segment?

(i) #include<iostream>
using namespace std;
int main()
{
    int a=3;
    int b=4;
    int c=(a%b)*6;
    int d=c/b;

```
float e=(a+b+c+d)/4;
cout<<"value of e is :"<<e<<endl;
return 0;
}
```

(ii)
```
#include<iostream>
using namespace std;
int main()
{
int a = 20;
int &n = a;
n=a++;
a=n++;
cout<<a <<","<<n<<endl;
return 0;
}
```
(3+3)

(g) Differentiate between break and continue statement using suitable examples. (2)

(h) Explain the concept of Data Hiding and Data Abstraction with respect to Object Oriented programming. (4)

Section B

2. (a) Write a C++ program to input a number from the user and print the reverse of the number. (5)

P.T.O.

(b) Write a C++ program to print the following output:

```
1
2 2
3 3 3
4 4 4 4
5 5 5 5 5
```

(5)

(c) Write the output of the following program

```cpp
int main()
{
int ans = 27;
ans += 10;
cout << ans << ", ";
ans -= 7;
cout << ans << ", ";
ans *= 2;
cout << ans << ", ";
ans /= 3;
cout << ans << ", ";
ans %= 3;
cout << ans << endl;
return 0;
}
```

(5)

3. (a) How many times the following do..while loop will execute. Also write the final values of x and y.

```
x=5;
y=20;
do
x=x+2;
while(x>=y);
cout<<x<<" "<<y<<endl;
```
(5)

(b) Write a program to input a character from the user and check whether it is a vowel or not using switch case. (5)

(c) A video library rents·new videos for Rs. 75 a day and old movies for Rs. 60 a day. Write a C++ program to calculate the total charge for a customer's video rentals. Input the number of each type of videos rented by the customer and output the total cost. (5)

4. (a) Write a function in C++ that takes an integer as an argument and finds the sum of all integers up that number. (5)

(b) Write the elements of the array after execution of the following code:

```
arr[0]=5
for(int i=1;i<6;i++)
{
```

```
arr[i]=i*i+5;
if(i>2)
arr[i]=2*arr[i]-arr[i-1];
}
```
(5)

(c) Identify the type of the following program elements.

myfun()

'z'

3.14

salary

sales[5]

(5)

5. (a) Write a C++ program to print the sum of odd numbers between 1 to 50 using a while loop.

(5)

(b) What will be the output of the following code

```
int x, y;
int* p = &x;
int* q = &y;
x = 35; y = 46;
p = q;
*p = 78;
cout<< x << " " << y.<< endl;
cout<< *p << " " << *q << endl;
```
(5)

(c) Write a C++ program to create an array Studentmarks. Input total marks for 5 students and calculate the average marks of all the students.

(5)

6. (a) Write a program to create a class Arithmetic with private data member num1 and num2. Add the following public member functions A default constructor

(i) A constructor with two arguments

(ii) A function that computes the sum

(iii) A function that displays the sum

(iv) Show how these functions will be called from the main function. (10)

(b) Write a statement to

(i) use a conditional operator to set ticket to 1 if speed is greater than 55, and to 0 otherwise.

(ii) use a logical operator that is true if limit is 55 and speed is greater than 55.

(iii) check if salary is greater than 50000 or age is less than 60.

(iv) Set an integer constant to a value of 5.

(v) initialize an array of type double with 5 values.

(5)

7. (a) A company decides to give bonus to all its employees. A 5% bonus on salary is given to the male workers and 10% on salary to female workers. Write a C++ program to enter the salary and the gender of the employee. If the salary is less than 10,000 then the employee gets an extra 2% bonus on salary. Calculate the bonus that has to be given to the employee and display the salary that the employee will get.

(5)

(b) Differentiate between do..while and while loops with the help of an example.

(5)

(c) Identify invalid variable names and correct them.

(i) A123

(ii) myvar

(iii) ABC001

(iv) 11myrollno

(v) &xyz

(5)

D

Sr. No. of Question Paper : 1140

Unique Paper Code   : 2342201102

Name of the Paper   : A1- Programming Fundamentals using Python

Name of the Course   : **B.A. Program**

Semester   : I

Duration : 3 Hours   Maximum Marks : 90

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.

2. **Section A** is compulsory.

3. Attempt any **four** questions from Section B.

4. Parts of a question must be answered together.

Section A
(Compulsory)

1. (a) Using suitable example, explain the use of below python built-in functions

                                                   (5)

(i) eval ()

(ii) type ()

(iii) set ()

(iv) dir ()

(v) strip ()

(b) Find the output of below code, in case of errors explain the problem

(5)

(i) K = 13 + 5 ** 2 − 21 / 7
   print(K)

(ii) Z = 3
    X, Y = Z, 5
    X, Y = Y, X
    print("X= ", X, ", Y= ", Y)

(iii) Var1 = 17
     Var1 //= 7
     print('Python ' * Var1)

(iv) s1 = "Python Programming"
    print(s1[0], s1[−1], s1[−18])

(v) for i in range (1, 11, 2):
       print(i ** 2)

(c) Write a python program using nested loops that prints the following pattern (for n = 7 rows).

Take the number of rows n as an input from the user. (5)

```
    * *
   * * * *
  * * * * * *
 * * * * * * * *
  * * * * * *
   * * * *
    * *
```

(d) Write three differences between **list** and **tuple** data structure used in python. (3)

(e) Write a python function findMax(), that take two integer parameters and return the maximum of the both numbers. (3)

(f) With the help of suitable examples, explain the use of **try** and **except** blocks used in python for error handling. (3)

(g) Explain the use of following strings module functions using suitable example (3)

    (i) isdigit ()

    (ii) swapcase ()

    (iii) split ()

(h) What are mutable and immutable objects in python? Create a dictionary data type object and explain why it is mutable? (3)

4

Section B

2. (a) When should we use **set** data structure? Show any two built-in functions used for **set** data type.

(5)

(b) Given a list L1 = [22, 11, 88, 55, 23, 60, 70]. Write Python code to perform following task :

(10)

   (i) Sort the list L1 in descending order

   (ii) Remove element '55' from the list L1

   (iii) Write code to print alternate elements of list L1

   (iv) Print the given list L1 in reverse order

   (v) Find the sum of all element present in the list L1

3. (a) With the help of suitable examples define a dictionary object and explain the purpose of **items()** and **values()** methods used for dictionary objects.

(5)

(b) Write the output that will be produced after execution of the following code segments, identify errors if present.

(10)

   (i) x=3

   y=2

   if x>2:

5

```
        if y>2:
            z = x + y
            print("Z is: ", z)
        else:
            print("x is: ", x)
```

(ii) for i in range (1, 5) :

```
        j = 0
        while j<i :
            print(j, end=" ")
            j += 1
```

(iii) d={'Name' : 'Komal', 'Age':7}
```
        print(d.get('Name'))
        d['address']='delhi'
        print(d.keys ( ) )
```

(iv) print("Python"[: :-1])

(v) print(list('Goodbye'))

4. (a) What are the features of set data structure?
   Consider the following two sets:

   (5)

   x = set(["green", "blue", "yellow", "red"])

   y = set(["blue", "yellow", "pink", "orange"])

   Perform the following tasks :

(i) Find the union of both sets x and y

(ii) Perform the intersection of both sets x an y

(iii) Perform the Difference of both sets (x − y

(b) Write a menu driven python program using use, defined functions to perform following tasks :

(10)

(i) Create a function to compute area of square, function should take one parameter for length of a side of square

(ii) Create a function to compute the area of the rectangle; this function should take two parameters, length and width of the rectangle.

(iii) Create a function to compute the area of the circle; this function should take the parameter radius of the circle.

(iv) All the three functions created above should take the user choice and based on the user choice, a respected function should be executed:

5. (a) What will be the output of following code segments

(5)

(i) num = 0
while num < 20 :
    num += 3
    print(num, end= ',')

(ii) for i in range (1, 11, 2):

   print(' 3 x ', i , ' = ', 3 * i)

(b) For the given string testStr = "Programming is fun", perform the following tasks using built-in functions (10)

(i) Print the string in reverse order

(ii) Print the alternate character present in testStr

(iii) Replace the word 'fun' with 'easy' and print the new string

(iv) Using len() function, print the middle character present in testStr string

(v) Print the substring starting from character 7 to 16

6. (a) Write a python program to print the below series, and sum of the series. Number of terms should be taken from the user.

   1, 1/2, 1/4, 1/8 .... up to n terms (5)

(b) Write a python program to compute the area of a triangle using math library functions. Formula to compute area is given as

$$\sqrt{s(s-a)(s-b)(s-c)}$$

where a, b and c are the three sides of triangle and s = (a + b + c)/2

Also, raise Exception if sum of any two sides is less than third side. (10)

7. (a) Identify valid and invalid identifiers as given below, state the reason of invalid identifiers

(5)

(i) #ofObjets

(ii) No of elements

(iii) 4List

(iv) studentEmail

(v) continue

(b) Find the output of the following python program, in case of error, correct the code. (5)

```
str1 = "Python is fun"
str2 = "I like Python"
for i in str1:
    if i in str2:
        print(i, end=" ")
```

(c) Given a tuple t1 = (12, 17, 22, 13, 71, 47, 9, 66, 38, 74), write python code to perform the following tasks

(i) Print all odd number present in the tuple t1

(ii) Print first half of the elements present in the tuple t1
(5)

(500)

[This question paper contains 6 printed pages.]

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.

2. Attempt **all** questions.

3. Answers may be written either in English or Hindi; but the same medium should be used throughout the paper.

छात्रों के लिए निर्देश

1. इस प्रश्न-पत्र के मिलते ही ऊपर दिए गए निर्धारित स्थान पर अपना अनुक्रमांक लिखिए ।

2. सभी प्रश्न कीजिए।

3. इस प्रश्न-पत्र का उत्तर अंग्रेजी या हिंदी किसी एक भाषा में दीजिए, लेकिन सभी उत्तरों का माध्यम एक ही होना चाहिए।

1. State True (T) or False (F). Give reasons for the same :

   (a) In storage capacity, Primary memory can hold larger data than secondary memory.

   (b) RAM is a secondary memory.

   (c) Multiprocessing operating system may run on the system having two or more processors.

   (d) Printers are part of Input unit in a computer.

   (e) Registers are special purpose, high speed permanent memory units.   (2×5)

सही (T) या गलत (F) बताइए। इसके कारण दीजिए :

   (क) भंडारण क्षमता में, प्राथमिक मेमोरी द्वितीयक मेमोरी की तुलना में बड़ा डेटा रख सकती है।

(ख) RAM एक सेकेंडरी मेमोरी है।

(ग) मल्टीप्रोसेसिंग ऑपरेटिंग सिस्टम दो या दो से अधिक प्रोसेसर वाले सिस्टम पर चल सकता है।

(घ) प्रिंटर कंप्यूटर में इनपुट यूनिट का हिस्सा होते हैं।

(ङ) रजिस्टर विशेष उद्देश्य, उच्च गति वाली स्थायी मेमोरी यूनिट हैं।

2. (a) Discuss in detail the functional units of computer.

    (b) What is cell referencing in a Spreadsheet? Discuss the types of referencing.

    OR

    (a) Explain and differentiate between the characteristics of Analog and Digital Computers

    (b) Explain the development in computer technology systems after 1950. (2×5)

    (क) कंप्यूटर की फंक्शनल इकाइयों पर विस्तार से चर्चा कीजिए।

(ख) स्प्रेडशीट में सेल रेफरेंसिंग क्या है? संदर्भ के प्रकारों की चर्चा कीजिए।

या

(क) एनालॉग और डिजिटल कंप्यूटर की विशेषताओं के बीच व्याख्या कीजिए और उनमें विभेद कीजिए।

(ख) 1950 के बाद कंप्यूटर प्रौद्योगिकी प्रणालियों में हुए विकास की व्याख्या कीजिए।

3. (a) Discuss in detail various applications of computers in Business.

   (b) Define registers in CPU? List any five registers with their functions.

OR

(a) What is an operating system? Differentiate between GUI and DOS based operating systems.

(b) Explain the types of alignment in word document with the help of a suitable example.   (2×5)

(क) व्यवसाय में कंप्यूटर के विभिन्न अनुप्रयोगों की विस्तार से चर्चा कीजिए।

(ख) सीपीयू में रजिस्टरों को परिभाषित कीजिए? किन्हीं पाँच रजिस्टरों की सूची उनके फंक्शन सहित लिखिए।

या

(क) एक ऑपरेटिंग सिस्टम क्या है? जीयूआई और डॉस आधारित ऑपरेटिंग सिस्टम के बीच अंतर कीजिए।

(ख) उपयुक्त उदाहरण की सहायता से वर्ड डॉक्यूमेंट में एलाइनमेंट के प्रकार समझाइए।

5. Write short notes on any **two** of the following :

(a) Optical disk and Magnetic disk

(b) Optical Mark Reader and Bar Code Reader

(c) Landscape and Portrait page layout orientations

(2×4)

निम्नलिखित में से किन्हीं **दो** पर संक्षिप्त टिप्पणियाँ लिखिए :

(क) ऑप्टिकल डिस्क और मैग्नेटिक डिस्क

(ख) ऑप्टिकल मार्क रीडर और बार कोड रीडर

(ग) लैंडस्केप और पोर्ट्रेट पेज लेआउट ओरिएंटेशन

[This question paper contains 8 printed pages.]

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

Sr. No. of Question Paper : 2113   C

Unique Paper Code   : 62343319

Name of the Paper   : PHP Programming

Name of the Course   : B.A. Program

Semester   : III

Duration : 2 Hours   Maximum Marks : 25

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.

2. The Question paper consists of two sections.

3. Section A is compulsory.

4. Attempt any three questions from Section B.

5. All Parts of a question must be attempted together.

SECTION A

Each Question carries 1 mark.

1. (i) Which of the following is correct to add a comment in PHP?

P.T.O.

2113

(a) & ...... &

(b) // ......

(c) /* ...... */

(d) Both (b) and (c)

(ii) Which of the following is used to display the output in PHP?

(a) echo

(b) write

(c) print

(d) Both (a) and (c)

(iii) Which of the following is the correct way of defining a variable in PHP?

(a) $ variable name = value;

(b) $variable_name = value;

(c) $variable_name = value

(d) $variable name as value;

(iv) String values in PHP must be enclosed within

(a) Double Quotes

(b) Single Quotes

(c) Both (a) and (b)

(d) None of the above

(v) Which of the following variable name is invalid?

(a) $newVar

(b) $new_Var

(c) $new-var

(d) All of the above

(vi) Which of the following is the correct way to create an array in PHP?

(a) $season = array["summer", "winter", "spring", "autumn"];

(b) $season = array("summer", "winter", "spring", "autumn");

(c) $season = "summer", "winter", "spring", "autumn";

(d) All of the above

(vii) What will be the output of the following program?

```php
<?php
$var1 = "Hello";
$var2 = "World";
echo $var1, $var2;
?>
```

(a) HelloWorld

(b) Hello, World

(c) HelloWorld

(d) None of the above

(viii) What will be the output of the following program?

```php
<? php
$x = 15;
$y = 20;
if($x < ++$x || $y < ++$y)
{
echo "Hello World";
}
else
{
echo "Hii everyone";
}
?>
```

(a) Hii everyone

(b) Hello World

(c) Hello World Hii everyone

(d) None of the above

(ix) What will be the output of the following PHP code?

```php
<?php
$x = 4;
$y = 3
$z = 1;
$z = $z + $x + $y;
echo "$z";
?>
```

(a) 15

(b) 8

(c) 1

(d) $z

(x) If $a = 12 what will be returned when ($a == 12) ? 5 : 1 is executed?

(a) 1

(b) 5

(c) 12

(d) Error

SECTION B

2. (a) Construct logical expressions in PHP for representing the following conditions : (3)

   - 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.

   (b) What will be the output of the following PHP script? Write step-by-step execution. (2)

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

3. (a) Explain indexed arrays in PHP with the help of an example.

(2)

(b) 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.

(3)

4. (a) PHP is a programing language that generates dynamic result for web pages. Justify.

(3)

(b) Write a PHP Program to calculate the sum of first 10 even numbers.

(2)

P.T.O.

5. Consider the following array where name, code and price of various items is listed respectively. (5)

$item_details= array (

        array ("Printer",001,18000),

        array("Monitor",002,10000),

        array("Laptop",003,40000),

        array("Mouse",004,500)

    );

Writethe PHP statements for each of the following :

(a) Count the number of products

(b) Calculate the total cost of all the products

(c) Change the price of Mouse to 700

6. Explain arithmetic, logical and conditional operators in PHP with examples. (5)

(1500)

[This question paper contains 4 printed pages.]

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

Sr. No. of Question Paper : 2130   C

Unique Paper Code   : 62344330

Name of the Paper   : Computer Network And
                           HTML

Name of the Course   : B.A. Programme (LOCF)

Semester   : III

Duration : 3 Hours   Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.

2. **Section A** is Compulsory.

3. Attempt any **Five** Questions from Section B.

SECTION A (Total 25 marks)

1. (a) Define the following terms :   (3)

   (i) Internet

   (ii) Repeater

   (iii) Digital Signals

   (b) Which topology is commonly used in a computer lab? Give its two advantages and disadvantages each.   (3)

P.T.O.

(c) Which connecting device is known as the three-layer connecting device. List the functions performed by this device? (3)

(d) Differentiate between LAN, MAN and WAN. (3)

(e) Explain simplex data flow. How is it different from half duplex communication. (3)

(f) What is the purpose of COLSPAN option in HTML? Explain with an example. (2)

(g) Explain the address depletion problem of IPv4 classful addressing. (2)

(h) What are the data objects exchanged at the data link layer and the network layer of the TCP/IP protocol suite. (2)

(i) Explain the purpose of anchor tag? (2)

(j) What is attenuation? (2)

SECTION B

2. (a) Explain the 4 fundamental characteristics of the data communication system. (4)

(b) Give the main functions of the Transport Layer in TCP/IP Protocol Suite. Differentiate between connection-oriented and connectionless Protocol Suite. (6)

3. (a) Write HTML code to design the following table :

(4)

Row1 Col1	Row 1 Col2	Row1 Col3
Row2 Col1	Row2 Col2	
Row3 Col1	Row3 Col2	Row3 Col3
	Row4 Col2	Row4 Col3

(b) Design an HTML form for an admission portal :-

ADMISSION PORTAL

Name *

Father's Name *

Address*

Marks Obtained *

Email

Do you belong to Delhi state:

◯ Yes ◯ No

Course in which you are applying: -

☐ BA(Prog)   ☐ BSc(Prog)

☐ BA(Hons) His   ☐ BSc(Hons)

SUBMIT   RESET

(6)

(4)

4 (a) Explain any two network commands :

(i) Netstat

(ii) Ping

(iii) Tracert

P.T.O.

(b) Explain the different parts of your browser. Identify and explain the different parts of URL "http://www.collegedekho.com/compsci/main.html". (6)

5. (a) What is transmission impairment? Explain its types. (4)

(b) Differentiate between wired and wireless media. Why should we use optical fibre for data transmission? (6)

6. (a) Differentiate between IPv4 and IPv6 addressing. Convert the IPv4 address 130.24.24.18 into IPv6 address. (5)

(b) What is a wireless LAN. How is it different from a wired LAN? (5)

7. (a) Explain the essential criteria which a computer network must meet? (5)

(b) What are the five components of data communication? (5)

8. Write short notes on the following (Any **four**) :

   (i) Geosynchronous satellite (ii) SMTP

   (iii) HTTP

   (iv) <input> tag

   (v) Gateway

   (vi) NIC
   (10)

(1500)

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.

2. Question No. 1 is compulsory.

3. Attempt any 5 of Question Nos. 2 to 8.

4. All parts of a question must be answered together.

1. (a) Identify valid identifier(s). Justify your answer :

(4)

     (i) $GasPrice

     (ii) 3python

     (iii) _myname

(iv) Total_Marks

(v) Dob

(vi) else

(vii) Address 99

(b) Construct logical expressions for representing the
following conditions : (3)

(i) Salary is greater than 35000 and less
than 45000.

(ii) Gender is female or Age is less than
65.

(iii) Length of variable name is greater than
15.

(c) What will be the output of the following code
segment : (2)

```
a=15
a/=5
print(a)
a%=2
print(a)
```

(d) Differentiate between syntax errors and semantic errors with the help of an example of each. (4)

(e) Find the output in each of the following code snippets : (5)

A. Consider the given list:

```
List1= [80,75,83]

List1=List1+[85]

print(List1)

List=List1

List1[1]=90

print(List)
```

B. Consider the given tuple:

```
t= (2, 4, 6, 8)

t= (5,) + t[1:]

print(t)

print (t*2)
```

(f) Write a python function named as Wordscount (s) that take a string s as an argument and return the number of words in that string. (3)

(g) Given the following recursive function :   (4)

```
def foo(n):
    if (n<0):
        return -1
    if (n==0):
        return 1
    return (n*foo(n-1))
```

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

2. (a) A dictionary month is defined as :   (5)

month= {'Jan':31, 'Feb':28, 'March':30, 'April':31}

Give the output of the following statements:

(i) print (month ['March'])

(ii) print ('Jan' in month)

(iii) print (month.get ('Feb', 0))

(iv) print (list (month.keys ()))

(v) print (list (month.values ()))

(b) Write a python program to calculate the grade of a student in college. Ask user to enter marks and print the corresponding grade.

The college has following rules for grading system:

Marks	Grade
45 to 50	D
50 to 60	C
60 to 80	B
Above 80	A	(5)

3. (a) Write a function called chop(1) that takes a list las an argument and remove the first and last elements and display the modified list11. For eg. 1=[10,11,12,13,14,15,16], so, the function should display list11=[11,12,13,14,15]. The original list should not be modified. (5)

(b) Write a program using for loop to print the following pattern of n rows: (5)

For example: if n is 5, following 5 lines of pattern will be printed:

```
      .
     . .
    . . .
   . . . .
  . . . . .
```

4. (a) Write the output of the following string functions on the given string colors: (5)

colors='Red, green, blue, Red, Red, green'

(i) print (colors.find ('red'))

(ii) print (colors.istitle ())

(iii) print (colors.split (','))

(iv) print (colors [1: len (colors) : 3])

(v) print (colors.capitalize ())

(b) Write a python program that takes a number as input and determine whether it is prime number or not. A number that is divisible only by itself and 1 is called prime number. (5)

5. (a) Give the output of the following code snippet: (2)

```
a=2

def test() :

    global a

    a=a+1

    print (a)

print (a)
```

(b) Give the value of add variable that will be produced by code segment given below: (Justify your output) (4).

```
i=0

add=0

while i<9:
```

```
if i%4==0:
        add=add+i
    i=i+2
print(add)
```

(c) Evaluate the following expressions: (4)

(i) 12 & 22

(ii) 5%10+10-25*8//5

(iii) 14 ^ 18

(iv) 'hello'*5 >'hello' or 'bye '<'Bye'

6. (a) Consider two sets values and squares given
    below :
                                                    (5)

    values={1,2,3,4,5,6,7,8,9}

    squares={1,4,9,16,25}

    Write the set operations using python operator to
    determine following : .

    (i) All the numbers whether values or squares.

(ii) Those numbers which are both values and squares.

(iii) Those values which are not squares.

(iv) To check if squares is subset of values.

(v) To check if values is superset of squares.

(b) Consider the following function: (5)

```
defnMultiple(a=0, num=1):
    return a*num
```

what will be the output produced when the following calls are made :

(i) nMultiple (5)

(ii) nMultiple (5, 6)

(iii) nMultiple (num=7)

(iv) nMultiple (num=6, a=5)

(v) nMultiple (5, num=6)

7. (a) What output will be produced on execution of tl
following code segment?

(i) class Area:

```
def __init__ (self):
    self.rad=10
    self.a=0
def cal(self):
    a=self.rad*self.rad
    return a
Al=Area()
print (Al.cal())
```

(ii) count=35

```
for x in range(0,10):
    count-=1
    if x==2:
        break
print (count)
```

(b) Write one line python code for-　　　　　　(2)

  (i) Swapping two numbers without using a third variable. ·

  (ii) Generating the series 7, 14, 21, ..., 70 using the range function.

(c) Write a function maximum (x, y) to calculate and return maximum of the two numbers x and y. Use this function to find maximum of three numbers.   (4)

8. Define a class Student that keeps tracks of academic record of students in a school.   (10)

The class should contain the following data members:

rollNum- Roll number of student

name- Name of student

marks- Total Marks of student (considering 500 as maximum marks)

stream- ' A': Arts, 'C': Commerce , 'S': Science

percent- Percentage computed using Marks

The class should support the following methods:

- __init__ for initializing the data members – rollNum, name, marks & stream

- getStream for displaying the stream of the student

- percentage for computing and printing the overall percentage for the student.

- printDetails to print the details of the student including rollNum, name, marks and stream

Create an object s1 of class Student with the rollNum as 1101 and name='Archit', marks=425 and stream as 'A'. Call percentage method to calculate the percentage using object s1.

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

Sr. No. of Question Paper : 1499   C

Unique Paper Code   : 42347501

Name of the Paper   : Data Structure

Name of the Course   : **B.Sc. (P) LOCF (DSE)**

Semester   : V

Duration : 3 Hours   Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.

2. The paper has **two** sections. **All** questions in 'Section A' are compulsory.

3. Attempt any **five** questions from 'Section B'. Parts of a question must be answered together.

SECTION A

1. (a) Mergesort needs additional storage for merging arrays which is a serious drawback for large amounts of data. Give one solution for this problem.   (2)

(b) Consider the linear array a (5 : 50). Suppose base (a) = 300 and w = 4 words per memory cell for a. Find the address of a [15], a [35]. (2)

(c) Explain briefly the two main operations on a stack. (2)

(d) Differentiate between an array and a linked list. (2)

(e) Draw a diagram for a complete binary tree having five nodes. (2)

(f) Which one is more efficient, binary search or linear search? Justify your answer. (2)

(g) What operation does the following code perform on a singly linked list. Explain (2)

```
void func( int x)

{

    head = new node (x, head);

    if ( tail = = 0)

        tail = head;

}
```

(h) Suppose a circular queue of capacity n elements is implemented with an array of n elements. Assume that the insertion and deletion operation are carried out using FIRST and LAST as array index variables, respectively. Initially, FIRST = LAST = -1. Write the conditions to detect if the queue is full, and the queue is empty. (3)

(i) Show all the steps of a stack while adding 679 and 2530. (4)

(j) Write a pseudocode for a recursive function to find the factorial of a number. (4)

SECTION B

2. (a) An array <77, 66, 55, 44, 33, 22, 11> is to be sorted in ascending order using quick sort. Show the status after each pass. (6)

    (b) Consider a circular queue "CQueue" of size 5. Show the status of the circular queue and the value of the variable FRONT and REAR after each of the following operations :

(i) Insert A, B, C, D, E to the "CQueue"

(ii) Delete A, B from the "CQueue"

(iii) Insert F

(iv) Delete C, D, E, F   (4)

3. (a) Consider the following arithmetic expression P, written in postfix notation where

   $A=12, B=7, C=3, D=2, E=1, F=5$:

   $$P: A \ B \ C - / D \ E \ F + * +$$

   (i) Translate P into its equivalent infix expression

   (ii) Evaluate the infix expression (show the steps using stack)   (6)

   (b) Write a pseudocode to add two large numbers using stack.   (4)

4. (a) Consider the following code fragment :   (6)

   Stack stack1 = new Stack();

```
while (!queue.isEmpty())

    stack1.push(queue.dequeue());

while (!stack1.isEmpty())

    queue.enqueue(stack1.pop());
```

What function does it perform on the queue? What will happen if we swap the queue and stack in the above-mentioned code fragment?

(**Note:** enqueue will now become push and vice versa. Also, pop now becomes dequeue and vice versa.)

(b) What kind of error can occur in an array implementation of queue? Give examples to illustrate it. How can this error be avoided?

(4)

5. (a) Differentiate between linked list and circular linked list with the help of an example. Also write a function to add a node at the end of a circular linked list.

(6)

(b) Explain the depth first and breadth first traversal of a tree with the help of an example.

(4)

6. (a) Consider the following sequence of operations performed on an initially empty doubly linked list :

    (i) addtohead (25),

    (ii) addtohead (28),

    (iii) addtotail (23),

    (iv) addtotail (20),

    (v) deletefromhead ( ),

    (vi) deletenode (23)

  Show the HEAD, TAIL, content of the list, and links between the nodes after each operation.
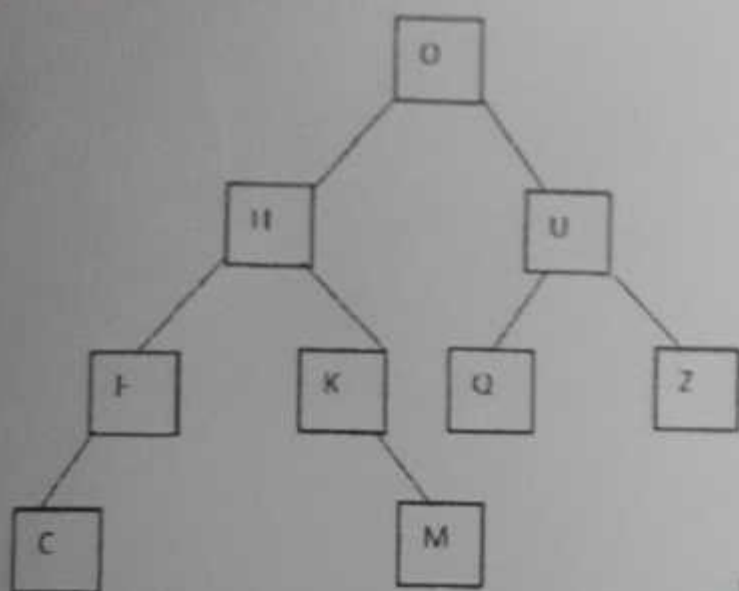
                (6)

  (b) Write a code to insert a node at the end of a singly linked list.

                (4)

7. (a) Consider the following binary tree: (6)

Determine the inorder, preorder, postorder traversal of the given tree. Also give the height of the above tree. Is the above tree a complete binary tree? Justify your answer.

(b) Define the following terms with the help of an example :

(i) Binary Search tree

(ii) Priority Queues (4)

(a) Consider the following code: (6)

8

```
int mul(int x)

{

    if (x<5)

        return (3*x);

    else

        return (2*mul(x-5)+7);

}
```

What value will be returned by function when mul is called. Explain each step of recursion. (10)

(b) Write the recursive function to calculate the GCD of the number. (4)