

B. Tech 3rd Semester Mid Term Examination- 2019
 Subject: DATA STRUCTURES AND PROGRAMMING METHODOLOGY
 (Paper Code: UCS03C14)

Time: 2 hour

Maximum Marks: 50

This exam contains 3 pages (including this page) and 8 problems.

[Section A]

This section comprises of questions to deal with the theoretical knowledge of the subject. Total marks of each question is equally divided among sub questions.

1. a) Explain the term pointer to a pointer. Use suitable example using pseudo code in C.
 b) Convert the following infix expression to post fix expression using stack. Explain the relevant stack operation $A * (B + C - (D \wedge E / F) * G) + H$
 c) The current state of queue is FRONT=9, REAR=9 and the size=10. The operations are applied as under:
 (i) Enqueue, (ii) Enqueue, (iii) Dequeue, (iv) Dequeue, (v) Dequeue, (vi) Enqueue, (vii) Enqueue, (viii) Enqueue, (ix) Enqueue, (x) Dequeue.
 Find the location of FRONT and REAR after the operations. [9]

2. a) Create a binary tree, where it is given
 In-order: D G B A H E I C F
 Pre-Order: A B D G C E H I F
 b) Explain the disadvantages of Binary Search with suitable example.
 c) How to insert a number in an array at its proper place when the array is already sorted in ascending order? Write the steps. [12]

3. a) Sort the following elements using bubble sort: 63, 25, 88, 46, 79, 10, 55, 34.
 b) Which data structures are applied when dealing with a recursive function? [4]

[Section B]

This section comprises of questions to identify the Data Structure application know how and problem solving ability. This includes concepts of programming and pseudo code understanding.

4. Explain the purpose of the function void mystery(int num, int b), assume that a=73, b=2 and find the output of the program.

```

1 include <stdio.h>
2 #include <conio.h>
3
4 void mystery(int num, int b)
5 {
6   if (num/b) mystery(num/b, b);
7   putchar(num%b + '0');
8 }
9
10 void main()
11 {

```

73	2
36	0
18	0
9	1
4	0
2	0
1	

```

clear();
a, b;
scanf("%d", &a);
scanf("%d", &b);
mystery(a, b);
getch();
}

```

[5]

5. Find the output of the following with explanation.

```

#include <stdio.h>
#include <conio.h>
void main()
{
    int i=2, j=3;
    i=i+j;
    i+=printf("Your problem starts here");
    j-- = --i;
    {
        if ( (i=5) && (j==25))
            printf("Incorrect");
        else
            printf("Think Again");
    }
    printf("\ni=%d j=%d", i, j);
}

```

[5]

6. What is the purpose of the following function, answer with explanation.

```

int mystery(char *s, char *t)
{
    for (; *s==*t && (*s!='\0' || *t!='\0'););
    return(*s-*t);
}

```

[5]

7. Explain the code and find the output.

```

#include <stdio.h>
#include <conio.h>
void f()
{
    i=10;
    printf("%d", i);
}
int i=5;
void main()
{

```

```

printf(    ,i);
f();
getch();
}

```

[5]

8. Find the output of the following with explanation .

```

#include <stdio.h>
int main()
{
    int i=0;
    while(i<20 && printf("%d ",i); i++)
    {
        switch(i)
        {
            case 0: i++;i*=2;
            case 20: i+=2;
            case 70: i+=6;
            default: i+=3;
        }
    }
}

```

[5]

This is for the student's reference

Question:	1	2	3	4	5	6	7	8	Total
Marks:	9	12	4	5	5	5	5	5	50
Score:									

Enrolment No.

S3(UCS03B06)CSE

B.Tech 3rd Semester Mid-Term Examination, 2019
Subject: - INTRODUCTION TO GRAPH THEORY
Paper Code: - UCS03B06

Total Marks:-50

Time: 2:00 hrs

Attempt all the questions.

1. ☒ a) Prove that "the number of vertices of odd degree in a graph is always even".
☒ b) A graph G having 100 vertices and 300 edges has a Minimum Spanning Tree (MST) weighting 500. When weight of each of the edge of G is increased by 7, what will be the weight of the new MST?
☒ c) Draw all possible labelled trees with v=4.
☒ d) Can there be a simple graph with degree sequence {2, 2, 3, 3, 4}? Why?
[2 + 3 + 4 + 1 = 10]
2. ☒ a) With proper diagram define edge disjoint and vertex disjoint sub graphs.
☒ b) Differentiate between components and blocks.
☒ c) Using Prim's algorithm find out the shortest spanning tree from the given graph.

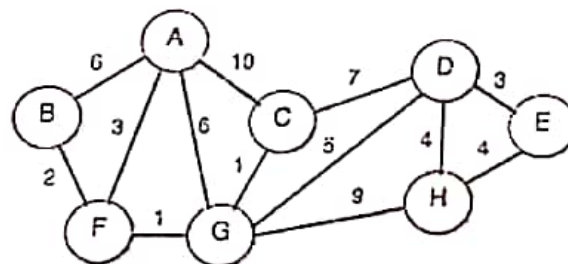


Figure - 1

[(1.5 X 2) + 2 + 5 = 10]

3. ☒ a) Given 4 cubes whose 6 faces are coloured with R, G, Y, and W. Is it possible to stack the cubes one on top of another to form a column such that no colour appears twice on any of the 4 sides of this column? Explain your answer.

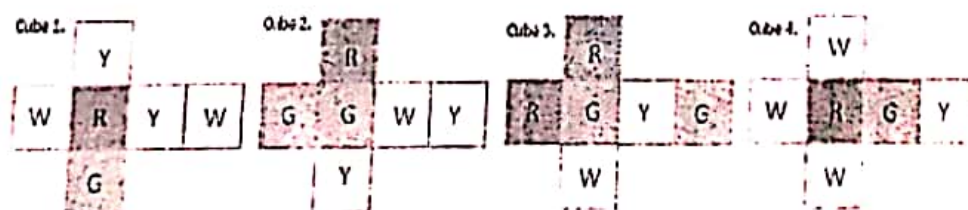


Figure - 2

- ☒ b) Define Unicursal Graph.
- ☒ c) Define - Pendant Vertex and Isolated Vertex with suitable diagram.

[6 + 1 + 3 = 10]

P.T.O.

4. a) A tree has $2n$ vertices of degree 1, $3n$ vertices of degree 2 and n vertices of degree 3. Determine the no. of vertices and edges in that tree.
 b) Show that – “the ring sum of two cut set is either a third cut set or an edge disjoint union of two cut sets”.
 c) How counting tree was originated?

$$[3 + 3 + 4 = 10]$$

5. a) Using Kirchhoff's Matrix Tree Theorem find out the number of spanning trees in the following graph. Draw all those spanning trees.

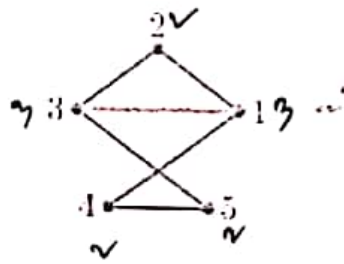


Figure - 3

- b) Draw all the possible fundamental cut sets from the above graph (figure 3).
 c) What is cut vertex?

$$[(4+2) + 2 + 2 = 10]$$

B. Tech 3rd Semester Mid Term Examination-2019

Department of Computer Science & Engineering

DIGITAL CIRCUITS & LOGIC DESIGN (UCS03C13)

Full Marks: 50 Marks

Time: 2Hrs

Instructions:

- 1| The figures in the margin indicate full marks for the questions.
- 2| All questions are compulsory.

1. a) With neat diagram compare in between Decoder, Encoder and Multiplexer.

(b) What is Priority Bit in Encoder? What is its benefit?

(c) Construct a Full Adder using Decoder.

(3+3+3) + (2+2) + 2 = 15

2. a) Determine the prime-implicants of the function: $F(w,x,y,z) = \sum (1, 4, 6, 7, 8, 9, 10, 11, 15)$. Simplify the function with K-Map also. Compare this two results.

(b) Compare with neat diagram/ logical circuit of Transmission Latch (BJT), NOR Latch. What are the main components of the flip flops.

(c) Construct a JK Master-Slave Flipflop with truth table and discuss its benefit.

(6) 4+5 = 15

3. a) Define the followings:

- i) Weighted code and unweighted code
- ii) Reflexive Code, Gray Code
- iii) Odd parity generator circuit
- iv) Odd parity checker circuit

(b) Do you know any error correcting code? Construct the code for 3-bit data and generate the data bits 100. If 1-bit error occurs in the code (data and parity bit combination), Find how the error bit corrected.

10+5 = 15

4. Choose the right option from the following questions:

a) Simplify the following using K-map : $F(A, B, C, D) = \sum (0, 1, 2, 8, 9, 12, 13)$
 $d(A, B, C, D) = \sum (10, 11, 14, 15)$ d stands for don't care condition.

- I. $A + B'D + BC$
- II. $A + B'D + B'C$
- III. $A + B'C$
- IV. $A' + B'C + B'D$

b) Consider the circuit in the diagram in Fig.1.. The \oplus operator represents Ex-OR. The D flipflops are initialized to zeroes (cleared).

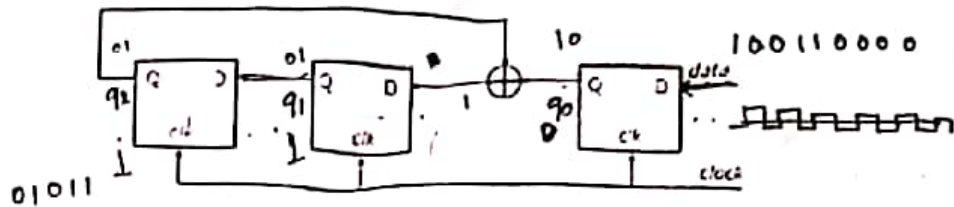


Fig.1.

12345

The following data: ~~100110000~~ is supplied to the "data" terminal in nine clock cycles. After that the values of q2q1q0 are:

- I. 000
- II. 001
- III. 010
- IV. 101

c) Which one of the following circuits is NOT equivalent to a 2-input XNOR (exclusive NOR) gate in Fig.2.

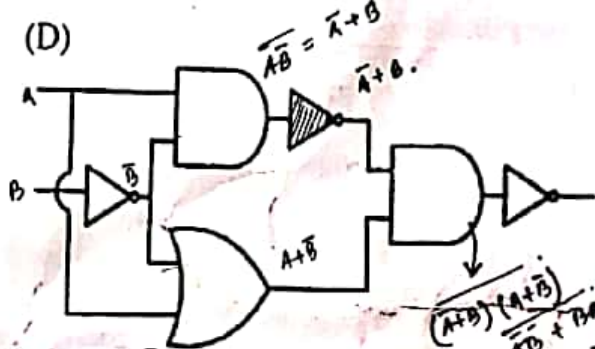
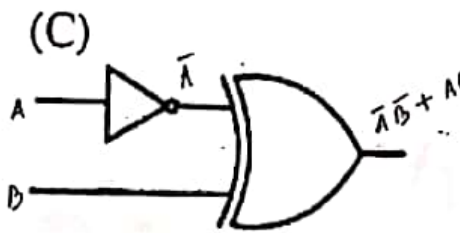
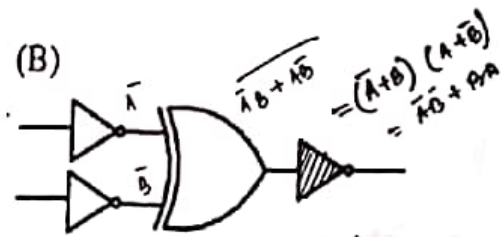
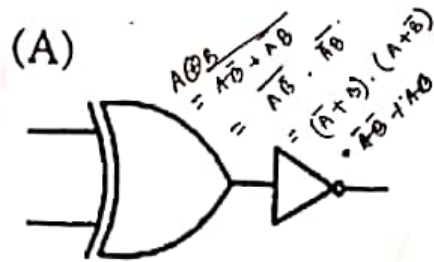


Fig.2.

- I. A
- II. B
- III. C
- IV. D

d) If P, Q, R are Boolean variables, then $(P + Q')(PQ' + PR)(P'R + Q')$ simplifies

- I. PQ'
- II. PR'
- III. PQ' + R
- IV. PR' + Q

e) Which one of the following expressions does NOT represent exclusive NOR of x and y?

- I. $xy + x'y'$ ✓
- II. $x \oplus y'$ ✓
- III. $x' \oplus y$ ✓
- IV. $x' \oplus y'$ ✓

Handwritten notes for part e):

$$xy + x'y' = x'y + xy'$$

$$x \oplus y' = x'y + xy'$$

$$x' \oplus y = x'y + xy'$$

$$x' \oplus y' = x'y' + xy$$

1X5 = 5

Enrollment No. 18445003

S₁ (All): All

B. Tech. 3rd Semester, Mid-Term Examination -2019

Name of Subject: Engineering Mathematics – III / Mathematics – III

Subject Code: UCE03C14/UME03C12/UEE03C13/C16/UCS03B02/C10/UEC03B07/UEI03C13/UPE03C14/
UCH03C17/UBE03C15

Full Marks: 50

Time: 2 hours

Symbols used here have their usual meanings

Group-A

Answer the following questions:

25 Marks

1. Find the Fourier series of $f(x) = x \sin x$ in $(0, 2\pi)$.
2. Expand the function $f(x) = x + x^2$ into Fourier Series in the interval $(-\pi, \pi)$ and hence deduce that
$$\frac{\pi^2}{6} = \frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \frac{1}{4^2} + \dots$$
3. Find the half range sine series for $f(x) = \begin{cases} \frac{1}{4} - x, & 0 < x < \frac{1}{2} \\ x - \frac{3}{4}, & \frac{1}{2} < x < 1 \end{cases}$
4. a) Write down Dirichlet's conditions for expansion of $f(x)$ into Fourier series.
b) Solve the partial differential equation: $(x^2 - y^2 - z^2)p + 2xyq = 2xz$.
5. Form a partial differential equation by eliminating the arbitrary function ϕ from $\phi(x^2 + y^2 + z^2, z^2 - 2xy) = 0$.

$$[5 + (4 + 2) + 4 + (2 + 4) + 4] = 25$$

Group-B

Answer the following questions:

5 × 5 = 25 Marks

1. A manager has two assistants and he bases his decision on information supplied independently by each one of them. The probability that he makes a mistake in his thinking is 0.005. The probability that an assistant gives wrong information is 0.3. Assuming that the mistakes made by the manager are independent of the information given by the assistants, find the probability that he reaches a wrong decision.

2. (a) State Bayes' theorem.

(b) The contents of urns 1, 2 and 3 are as follows:

	No. of white balls	No. of black balls	No. of red balls
Urn 1	1	2	3
Urn 2	2	1	1
Urn 3	4	5	3

One urn is chosen at random and two balls drawn from it. They happen to be white and red. What is the probability that they comes from (i) urn 1, (ii) urn 2 and (iii) urn 3?

P.T.O

3. The following is the probability distribution of a discrete random variable X :

x	0	1	2	3	4	5	6	7	8
$p(x)$	k	$3k$	$5k$	$7k$	$9k$	$11k$	$13k$	$15k$	$17k$

- (i) Find the value of k ,
- (ii) Find the distribution function of X ,
- (iii) Find the smallest value of x such that $P(X \leq x) > 0.5$

4. In a continuous distribution whose relative frequency density is given by:

$$f(x) = a \cdot x(2 - x), 0 \leq x \leq 2$$

Find the mean, variance, median, mean deviation about mean and mode of the distribution.

5. A multiple choice test consists of 8 questions with 3 answers to each question (of which only one is correct). A student answers each questions by rolling a die and checking the first answer if he gets 1 or 2, the second answer if he gets 3 or 4 and the third answer if he gets 5 or 6. To get a distinction, the student must secure at least 75% correct answer. If there is no negative marking, what is the probability that the student secures a distinction?

Enrollment No. 120101003

UCS03B05 CSB

B.Tech Third Semester Mid Term Examination- 2019

Name of Subject: Data Communication

Paper Code: UCS03B05

Full Marks: 50

Time: 2 Hours

The figures in the margin indicate full marks for the questions

Candidates are required to give their answers in their own words as far as practicable

All questions are compulsory

1. a) What is Transmission Impairment? Write and explain causes of Impairment.
b) A signal with 200 milliwatts power passes through 10 devices, each with an average noise of 2 microwatts. What is the SNR? What is the SNR_{dB}?
c) What is the total delay (latency) for a frame of size 5 million bits that is being sent on a link with 10 routers each having a queuing time of 2 μ s and a processing time of 1 μ s. The length of the link is 2000 Km.
 $B = 5$ (4+3+3=10)
2. a) What is Delta Modulation? Draw and explain components of delta modulation and demodulation.
b) We have sampled a low pass signal with bandwidth of 200 kHz using 1024 levels of quantization. Calculate SNR_{dB} and bit rate of the digitized signal.
c) What is the Nyquist sampling rate for a band pass signal with bandwidth of 200 kHz if the lowest frequency is 100 kHz?
(4+3+3=10)
3. a) What is multiplexing? Explain FDM process with suitable graphical illustration.
b) Assume that a voice channel occupies a bandwidth of 4kHz. We need to multiplex 10 voice channels with guard bands of 500Hz using FDM. Calculate the required bandwidth.
c) Distinguish between a link and a channel in multiplexing.
(4+3+3=10)
4. a) What is Phase Shift Keying? Explain QPSK with suitable example/graphical illustration.
b) Calculate the baud rate for 64-QAM, having bit rate 36000 bps.
c) Draw a constellation diagram for the two points at (0, 2) and (0, -2) where number in parentheses defines the value of I and Q respectively. Find the peak amplitude value and define the type of modulation.
(4+3+3=10)
5. a) What do you mean by line coding and decoding? What are the five broad categories in which line coding scheme is roughly divided. Name at least one scheme in each category.
b) What are the differences between parallel and serial transmission?
c) Draw the graph of AMI schemes using the data stream 11111111 and 01010101, assuming that the last signal level has been positive.
(4+3+3=10)

S₁ (UCS03B04) B.Tech

B.Tech. 3rd Semester Mid Term Examination, 2019
Discrete Mathematical Structures
UCS03B04

Full Marks: 50

Time: 2 hours

1. Determine whether these statements are true or false. Justify your answer.

- a. $0 \in \emptyset$
- ☒ b. $\emptyset \in \emptyset$
- ☒ c. $\{0\} \in \{0\}$
- d. $0 \subset \{0\}$
- e. $\{0\} \in \{\{0\}\}$

(5)

2. (a) What is the difference between Relation and a Function?

(b) Find the domain and range of the following functions:

- i. $Y = x^2$
- ☒ ii. $Y = 1/x$

(5)

3. In a survey of the usage of the toothpaste A, B and C, it is found that 60 people like A, 55 like B, 40 like C, 20 like A and B, 35 like B and C, 15 like A and C, and 10 like all the here toothpastes. Find the following:

- a. Number of persons involved in survey
- b. Number of persons who like A only
- c. Number of persons who like A and B but not C

(5)

4. Let R be a relation defined on a set of positive integers such that for all $x, y \in \mathbb{Z}^+ xRy$ if and only if $|x-y| < 7$. State whether R is Reflexive, Symetric, Transitive, Equivalence and Partial ordered.

(5)

5. A relation R is defined on the ordered pair of integers as follows: $(x,y)R(u,v)$ if $x < u$ and $y < v$. Find whether the relation R is equivalence and Partial Ordered Relation.

(5)

6. Test the validity of the following argument using propositional calculus:

If I study, then I will not fail mathematics.
 If I do not play basketball, then I will study.
 But I failed mathematics.
Therefore I must have played basketball.

(5)

7. We have two quantifiers viz: Universal and Existential. Illustrate with example whether the following propositional functions differ and why:

- a. $\exists x \forall y, p(x, y)$ and $\forall y \exists x, p(x, y)$
- b. $\forall x \forall y, p(x, y)$ and $\forall y \forall x, p(x, y)$
- c. $\forall x \exists y, p(x, y)$ and $\exists y \forall x, p(x, y)$
- d. $\exists x \exists y, p(x, y)$ and $\exists y \exists x, p(x, y)$
- e. $\exists x \forall y, p(x, y)$ and $\exists y \forall x, p(x, y)$

(10)

8. Determine whether the relation R on the set on all set of integers is reflexive, symmetric, antisymmetric and transitive where $(x,y) \in R$ if and only of

- a. $x \neq y$
- b. $xy \geq 1$
- ☒ c. $x = y - 1$ or $x = y + 1$
- d. $x \equiv y \pmod{7}$
- e. x is a multiple of y

(10)