

**DEPARTMENT OF COMPUTER SCIENCE & INFORMATION TECHNOLOGY**  
**TERMINAL EXAMINATION (December, 2023)**

**Subject:** Discrete Structure

**Semester:** CS & IT (2<sup>nd</sup>) (Morning)

**Max Marks:** 40

**Time:** 40 mints

**Roll NO:** 23

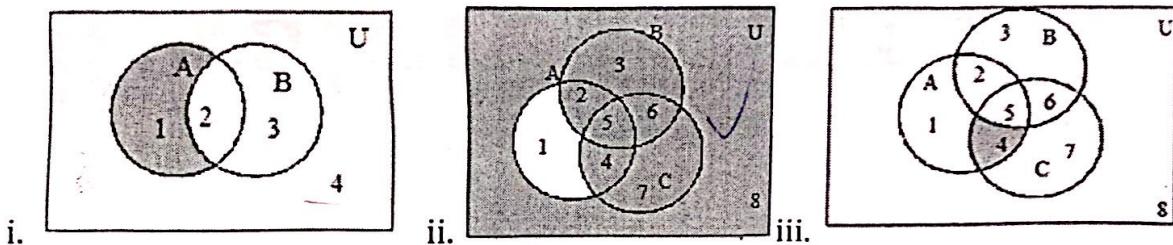
**NAME:** Zubair

**Note:** Attempt All questions

**Question#1:**

(a): When a function F from a set X to a set Y is a relation from X to Y ,that satisfies the two properties (Conditions) write down these properties.

(b): How to construct the Expressions of the give Venn diagrams. (Marks.8)



**Question#2:**

(a): How we can represent a relation in the form of matrix. Give answer with the help of example?

(b): Use a Venn diagram to represent the following. (Marks.12)

$$i. (A - B) \cap C$$

$$ii. (A \cap B^c) \cup C^c$$

$$iii. A^c \cup (B \cup C)$$

**Question#3:**

(a): How we can represent Matrix of an Inverse Relation? give answer with the help of example

(b): Prove that:

$$1. A \cap A^c = \emptyset$$

$$2. A \cup A^c = U$$

(C): What is mean by Injective Function and ir-reflexive matrix? Give an example of injective Function.

\*\*\*\*\*GOOD LUCK\*\*\*\*\*

**DEPARTMENT OF COMPUTER SCIENCE  
UNIVERSITY OF BALUCHISTAN**

**Class: BS(CS) 2<sup>nd</sup> semester**

**Time: 60 minutes**  
**Marks: 26**

**SUBJECTIVE**

**Q.No.1** Simplify following function using Quine-Mccluskey method or Karnaugh map:

$$F = A'B'C'D' + A'B'C'D + A'B'CD' + A'BCD' + AB'C'D + AB'C'D + AB'CD,$$

(Ans: -  $B'C' + B'D' + A'CD'$ )

**Q.No.2** Write a detailed note on memory elements.

**Subjective Portion**

**Q. No: 01.** What do you think the novel is trying to convey about pursuing one's dreams and aspirations?  
(15)

**Q: No. 02.** Write an essay on, "jirga System in Baluchistan." (15)

- b.  $R_2 = \{(2,4), (4,1), (4,2), (5,6)\}$   
c.  $R_3 = \{(2,4), (4,1), (5,6)\}$

**SOLUTION :**

- a.  $R_1$  is not a function, because  $5 \in X$  does not appear as the first element in any ordered pair in  $R_1$ .  
b.  $R_2$  is not a function, because the ordered pairs  $(4,1)$  and  $(4,2)$  have the same first element but different second elements.  
c.  $R_3$  defines a function because it satisfies both the conditions of the function that is every element of  $X$  is the first element of some ordered pair and there is no pair which has the same first order pair but different second order pair.

### ARROW DIAGRAM OF A FUNCTION:

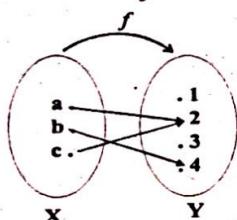
The definition of a function implies that the arrow diagram for a function  $f$  has the following two properties:

1. Every element of  $X$  has an arrow coming out of it
2. No two elements of  $X$  has two arrows coming out of it that point to two different elements of  $Y$ .

### **EXAMPLE:**

Let  $X = \{a,b,c\}$  and  $Y = \{1,2,3,4\}$ .

Define a function  $f$  from  $X$  to  $Y$  by the arrow diagram.

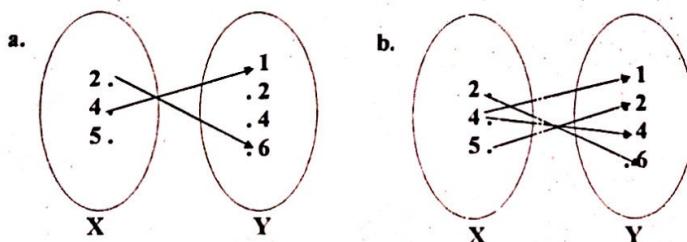


You can easily note that the above diagram satisfies the two conditions of a function hence a graph of the function.

Note that  $f(a) = 2$ ,  $f(b) = 4$ , and  $f(c) = 2$

### FUNCTIONS AND NONFUNCTIONS:

Which of the arrow diagrams define functions from  $X = \{2,4,5\}$  to  $Y = \{1,2,4,6\}$ .



The relation given in the diagram (a) is **Not a function** because there is no arrow coming out of  $5 \in X$  to any element of  $Y$ .

The relation in the diagram (b) is **Not a function**, because there are two arrows coming out of  $4 \in X$ . i.e.,  $4 \in X$  is not related to a unique element of  $Y$ .

### **EXERCISE:**

How many functions are there from a set with three elements to a set with four elements?

- b.  $R_2 = \{(2,4), (4,1), (4,2), (5,6)\}$   
c.  $R_3 = \{(2,4), (4,1), (5,6)\}$

**SOLUTION :**

- a.  $R_1$  is not a function, because  $5 \in X$  does not appear as the first element in any ordered pair in  $R_1$ .  
b.  $R_2$  is not a function, because the ordered pairs  $(4,1)$  and  $(4,2)$  have the same first element but different second elements.  
c.  $R_3$  defines a function because it satisfies both the conditions of the function that is every element of  $X$  is the first element of some order pair and there is no pair which has the same first order pair but different second order pair.

**ARROW DIAGRAM OF A FUNCTION:**

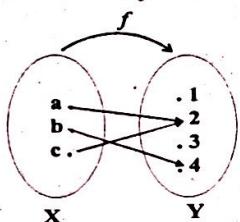
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**EXAMPLE:**

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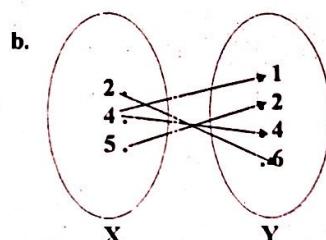
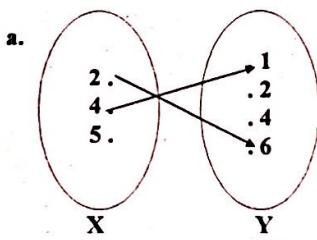


You can easily note that the above diagram satisfies the two conditions of a function hence a graph of the function.

Note that  $f(a) = 2, f(b) = 4$ , and  $f(c) = 2$

**FUNCTIONS AND NONFUNCTIONS:**

Which of the arrow diagrams define functions from  $X = \{2,4,5\}$  to  $Y = \{1,2,4,6\}$ .



The relation given in the diagram (a) is **Not a function** because there is no arrow coming out of  $5 \in X$  to any element of  $Y$ .

The relation in the diagram (b) is **Not a function**, because there are two arrows coming out of  $4 \in X$ . i.e.,  $4 \in X$  is not related to a unique element of  $Y$ .

**EXERCISE:**

How many functions are there from a set with three elements to a set with four elements?

**SOLUTION:**

Let  $A = \{1, 2, 3\}$  and  $R = \{(1,3), (2,1), (2,3), (3,2)\}$  be represented by the matrix

$$M = \begin{bmatrix} & 1 & 2 & 3 \\ 1 & 0 & 0 & 1 \\ 2 & 1 & 0 & 1 \\ 3 & 0 & 1 & 0 \end{bmatrix}$$

Then  $R$  is irreflexive, since all elements in the main diagonal are 0's.

### INVERSE OF RELATIONS

#### MATRIX REPRESENTATION OF INVERSE RELATION:

The relation  $R = \{(2, 2), (2, 6), (2, 8), (3, 6), (4, 8)\}$  from  $A = \{2, 3, 4\}$  to  $B = \{2, 6, 8\}$  is defined by the matrix  $M$  below:

$$M = \begin{bmatrix} & 2 & 6 & 8 \\ 2 & 1 & 1 & 1 \\ 3 & 0 & 1 & 0 \\ 4 & 0 & 0 & 1 \end{bmatrix}$$

$$M' = \begin{bmatrix} & 2 & 3 & 4 \\ 2 & 1 & 0 & 0 \\ 6 & 1 & 1 & 0 \\ 8 & 1 & 0 & 1 \end{bmatrix}$$

The matrix representation of inverse relation  $R^{-1}$  is obtained by simply taking its transpose. (i.e., changing rows by columns and columns by rows). Hence  $R^{-1}$  is represented by  $M'$  as shown.

### COMPLEMENTARY RELATION:

Let  $R$  be a relation from a set  $A$  to a set  $B$ . The complementary relation  $\bar{R}$  of  $R$  is the set of all those ordered pairs in  $A \times B$  that do not belong to  $R$ .

#### EXAMPLE:

Let  $A = \{1, 2, 3\}$  and  
 $R = \{(1, 1), (1, 3), (2, 2), (2, 3), (3, 1)\}$  be a relation on  $A$   
 Then  $\bar{R} = \{(1, 2), (2, 1), (3, 2), (3, 3)\}$

### FUNCTIONS

#### RELATIONS AND FUNCTIONS:

A function  $F$  from a set  $X$  to a set  $Y$  is a relation from  $X$  to  $Y$  that satisfies the following two properties

1. For every element  $x$  in  $X$ , there is an element  $y$  in  $Y$  such that  $(x, y) \in F$ .

In other words every element of  $X$  is the first element of some ordered pair of  $F$ .

2. For all elements  $x$  in  $X$  and  $y$  and  $z$  in  $Y$ , if  $(x, y) \in F$  and  $(x, z) \in F$ , then  $y = z$

In other words no two distinct ordered pairs in  $F$  have the same first element.

#### EXERCISE:

Which of the relations define functions from  $X = \{2, 4, 5\}$  to  $Y = \{1, 2, 4, 6\}$ .

- a.  $R_1 = \{(2, 4), (4, 1)\}$

Computer Science and Information Technology Department, UoB, Quetta

Course: Discrete Structures

BSCS 2021-2025 Terminal Exams Max Marks: 40 Time Allowed: 80 Minutes

Note: Answer all questions.

Question No 1: Prove the De Morgan's law  $(A \cup B)^c = A^c \cap B^c$

Question No 2: Find the 12<sup>th</sup> term of the sequence: 2, 4, 8, 16, 32, 64, ... 28 256 512 1024

2048 4096

Question No. 3: Solve the summations

$$\sum_{n=1}^{8} 2(n^2 - 1) = 2(3)^2 - 1 + 2(4)^2 - 1 + \dots + 2(8)^2 - 1$$

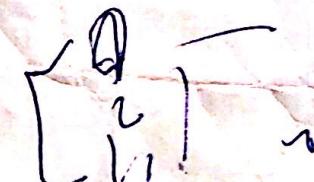
$$1. \sum_{n=1}^{8} 2n^2 - 1 = 2(3)^2 - 1 + 2(4)^2 - 1 + \dots + 2(8)^2 - 1$$

$$2. \sum_{n=1}^{3} (n+2)^2$$

Question No 4: Given the following matrices find values of x, y and z

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

$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 1 & 1 & 1 \\ 2 & 1 & 1 \\ 3 & 2 & 1 \end{bmatrix}^{-1} \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$$



$$\begin{aligned} & n=1 \quad 1 \\ & n=2 \quad 1, 2 \\ & n=3 \quad 1, 2, 3 \\ & n=4 \quad 1, 2, 3, 4 \\ & n=5 \quad 1, 2, 3, 4, 5 \\ & n=6 \quad 1, 2, 3, 4, 5, 6 \\ & n=7 \quad 1, 2, 3, 4, 5, 6, 7 \\ & n=8 \quad 1, 2, 3, 4, 5, 6, 7, 8 \end{aligned}$$

Computer Science and Information Technology Department, UoB, Quetta  
Course: Discrete Structures

Subjective

BSCS 2021-2025 Mid Term Exams Max Marks: 30 Time Allowed: 50 Minutes

Note: Attempt all questions. Do not write anything on the question paper.

Question No 2: Use set builder notation to give description of each of the following sets:

- i.  $\{-3, -2, -1, 0, 1, 2, 3\}$       ii.  $\{1, 2, 3, 5, 8, 13\}$

Question No 3: Let  $A = \{a, b\}$ ,  $B = \{2, 3\}$  and  $C = \{x, y\}$  find

- i.  $A \times B \times C$       ii.  $C \times B \times A$

Question No 4: Let  $A = \{x, y, z\}$  find the power set of  $A$ .

Question No 5: List the members of the following sets

- i.  $\{x \mid x \text{ is a real number such that } x^2 = 1\}$       ii.  $\{x \mid x \text{ is an integer less than } 12\}$

Q.No.3.(a) Find the invers of  $\begin{bmatrix} 0 & -1 & 0 \\ 0 & 0 & -1 \\ 1 & 0 & 0 \end{bmatrix}$

(b)  $\begin{bmatrix} 0 & 1 & 3 & -2 \\ 2 & 1 & -4 & 3 \\ 2 & 3 & 2 & -1 \end{bmatrix}$  Reduce echelon

Q.No.4 Solve the system of equation by matrix method

$$x_1 - x_2 + 2x_3 = 0$$

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

$$x_1 + x_2 + x_3 = -1$$

Q.No.5 (a) solve the system of equation by Gaussian elimination method

~~2/14  
18/6~~

$$x_1 - x_2 + 2x_3 = 0$$

$$(-3) - (-4x_1 + x_2 + 2x_3 = 1)$$

$$x_1 + x_2 + x_3 = -1$$

(b) for what value of  $\lambda$  the following homogeneous equation have nontrivial solution? Find the solution.

$$(3 - \lambda)x_1 - x_2 - x_3 = 0$$

$$x_1 - (1 - \lambda)x_2 + x_3 = 0$$

$$x_1 - x_2 + (1 - \lambda)x_3 = 0$$

Q.No.6.(a) without expansion prove that

$$\begin{vmatrix} bc & ca & ab \\ \frac{1}{a} & \frac{1}{b} & \frac{1}{c} \\ a^2 & b^2 & c^2 \end{vmatrix} = 0$$

(b) find the value of  $\begin{vmatrix} 3 & 7 & 5 & 2 \\ 2 & 4 & 1 & 1 \\ -2 & 0 & 0 & 0 \\ 1 & 1 & 3 & 4 \end{vmatrix}$

ОЧЕЛІВ ОУЧИРОВ СІРІНІ СІРІНІ СІРІНІ СІРІНІ



**DEPARTMENT OF COMPUTER SCIENCE  
&  
INFORMATION TECHNOLOGY  
UNIVERSITY OF BALOCHISTAN, QUETTA**

**Paper: Computer organization and assembly language      Class: BSCS3<sup>rd</sup> (Terminal)**  
**Time: 1 hour      Marks: 45**

**Note: Attempt any 3 Questions.**

- Q.No.1      Discuss in detail the function of I/O module.  
Q.No.2      Define elements of bus design. Describe them in detail.

Q.No. 3      Define the following

- (a) control memory      (b) hard-wired control      (c) microprogramming  
(d) microinstruction      (e) microprogram

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0.6

**DEPARTMENT OF COMPUTER SCIENCE**

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**INFORMATION TECHNOLOGY  
UNIVERSITY OF BALOCHISTAN, QUETTA**

**Class: BS(CS/IT) 2<sup>nd</sup> Semester**

(Terminal)

Time: 1  $\frac{1}{2}$  hour  
Max Marks: 16

**SUBJECTIVE**

Q.No. 1(a) Write a note on measure of central tendency?

(b) Given the following data calculate median?

Classes	10-19	20-29	30-39	40-49	50-59
Frequency	6	10	15	12	8

Q.No. 2(a) What is probability?

(b) A coin is tossed 2 times find the probability that?

$$\begin{aligned}
 & P(X=x) = \binom{n}{x} p^x \cdot q^{n-x} \\
 & P(X=2) = \binom{2}{2} p^2 \cdot q^0 \\
 & = \frac{1}{2} \cdot \frac{1}{2} \\
 & = \frac{1}{4}
 \end{aligned}$$

(i) exactly two heads occur. (ii) at least two heads. (iii) almost two heads. (iv) no heads occur

Q.No. 3 Let a distribution follows a binomial distribution with n=3 and p=0.4 find?

(i) exactly two defective. (ii) not more than 1 defective.

**Question No 2: Construct a grouped frequency distribution using the following data (10 Marks)**

106	107	76	82	109	107	115	93	187	95	123	125
111	92	86	70	126	68	130	129	139	119	115	128
100	186	84	99	113	204	111	141	136	123	90	115
98	110	78	185	162	178	140	152	173	146	158	194
148	90	107	181	131	75	184	104	110	80	118	82

**Question No 3: Using grouped frequency distribution you created in answer to question No. 2 calculate A.M. and Median. (10 Marks)**

(i) exactly two heads occur. (ii) atleast two heads. (iii) almost two heads. (iv) no heads occur

**Q.No. 3 Let a distribution is follows a binomial distribution with  $n=3$  and  $p=0.4$  find?**

- (i) exactly two defective. (ii) not more than 1 defective.

## **UNIVERSITY OF BALOCHISTAN**

DEPARTMENT OF COMPUTER SCIENCE & INFORMATION TECHNOLOGY

### **TERM EXAMINATION**

**Student Name** \_\_\_\_\_

**Roll No** \_\_\_\_\_

## **SUBJECTIVE**

**Q2. Define the any ten following with examples ("2" Mark each)**

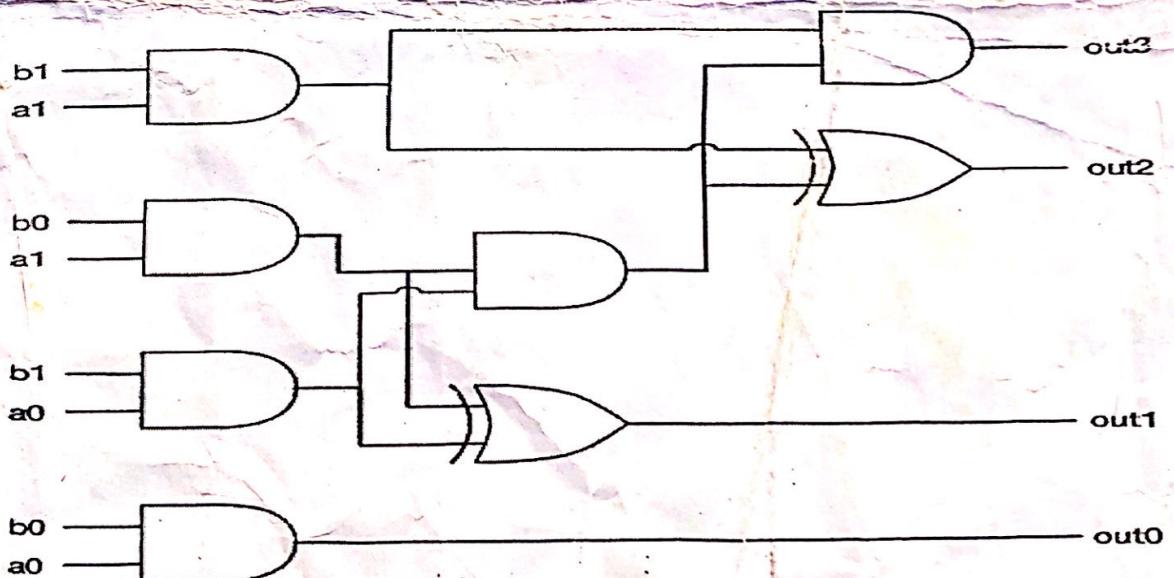
- |                              |               |
|------------------------------|---------------|
| 1. Loops                     | 11. PK        |
| 2. ✓ polymorphism            | 12. FK        |
| 3. ✓ Router                  | 13. DHCP      |
| 4. ✓ Logic Gates             | 14. DNS       |
| 5. ✓ IP                      | 15. VPN       |
| 6. ✓ MAC                     | 16. CSMA/CD ✓ |
| 7. ✓ ArgArguments a function | 17. LAN ✓     |
| 8. ✓ Conditional statement   | 18. RGB ✓     |
| 9. ✓ Arrays                  | 19. VLSI      |
| 10. Lists                    |               |

**Answer any 3 questions**

**Q3. Apply encryption on the given paragraph with your roll-no as the key. 15 marks**

Lies require commitment. Man is not what he thinks he is, he is what he hides. Things come apart so easily when they have been held together with lies.

Q4. Examine the given circuit and explain what it does 15 marks



**Q5. Examine the given network and write the sequence of access messages for given conditions**  
**15 marks**



**DEPARTMENT OF COMPUTER SCIENCE  
&  
INFORMATION TECHNOLOGY**  
**UNIVERSITY OF BALOCHISTAN, QUETTA**

**Class: BS(CS) 5<sup>th</sup> Semester**

**(Morning)**

**(MID TERM) Total Time: 60 Minutes**

**Total Marks: 30**

**NOTE: Attempt any three Questions.**

**Q#1.** ✓ What is an operating system? Briefly explain the services and functions of the operating system.

**Q#2** Explain process model with the help of suspend and resume states. Why suspend and resume states are important?

**Q#3** how do you differentiate interrupt and trap? Explain interrupt processing when interrupt occurs with examples.

**Q#4** Contrast and compare batched systems, multiprogrammed batched systems, and time-sharing systems

*Time sharing  
Faster to back*

Note: Section - I is compulsory. Attempt any 5 Questions from Section - II.

## Section -I

Q.No.1. solve the following

20 Marks

i. Define scalar matrix with example.

ii. what is idempotent matrix.

✓ iii. show that  $A = \begin{bmatrix} 1 & 1-i & 2 \\ 1+i & 3 & i \\ 2 & -i & 0 \end{bmatrix}$  is Hermitian matrix.

✓ iv. what is Nilpotent matrix.

✓ v. Show that  $A = \begin{bmatrix} 0 & a & b \\ -a & 0 & c \\ -b & -c & 0 \end{bmatrix}$  is skew symmetric matrix

vi.  $(A^H)^H = \dots \dots A \dots \dots$

✓ vii. When  $A^2 = I$  is called an ..... matrix

viii. If  $A = \begin{bmatrix} 1 & 2 \\ 3 & 5 \\ 3 & 0 \end{bmatrix}$  then order is =.....

ix. A square matrix A for which  $A^{k+1} = A$  is called a .....

x. What is Rank of matrix.

## Section -II

$5 \times 10 = 50$

Marks

Q.No.1. show the matrix

(a)  $A = \begin{bmatrix} 1 & -2 & -6 \\ -3 & 2 & 9 \\ 2 & 0 & -3 \end{bmatrix}$  is periodic having period 2

✓ (b) Show that  $A = \begin{bmatrix} 1 & -3 & -4 \\ -1 & 3 & 4 \\ 1 & -3 & -4 \end{bmatrix}$  is Nilpotent

Q.No.2. Let  $A = \begin{bmatrix} 1 & 2 & | & 1 \\ 3 & 4 & | & 0 \\ 0 & 0 & | & 2 \end{bmatrix}$  and  $B = \begin{bmatrix} 1 & 2 & 3 & | & 1 \\ 4 & 3 & 6 & | & 1 \\ 0 & 0 & 0 & | & 1 \end{bmatrix}$  compute AB using the indicated partitioning.

18. Note: Attempt All Questions

Q.No. 2. Found out the error in following program

(10)

```
# include <iostream>
# include <conio.h>
using namespace std;
class stu {
    int rno;
    char sname[15];
public:
void getdata(void)
{ cout "enter Student name";
    gets(sname);
    cout << "enter roll no for student ";
    cin >> rno;
    fflush(stdin); }

void showdata(void)
{ cout << "rno=" << rno << endl;
    cout << "Name=" << sname << endl; }

}
int main (void)
{
    class stu s[3];
    int a;
    for(a=0;a<3;a++)
    {
        s[a].getdata();
        s[a].showdata();
    }
}
```

Q.No. 3

Define any three of Following

(15)

i) Inheritance ii) Polymorphism

ii) Constructor

iv) function Overloading

Q.No.4.

Write a Program using Polymorphism

(15)

Constucted

Or

Write a Program for operator overloading

~~#include~~

class car()

private:

w

public:

2 Wheel, 2, vichal;

void get<sup>wheel</sup>()

Class mycycle cout << endl <<

mycycle wheel ()

Mycycle . wheel ()

number. wheel .

DEPARTMENT OF COMPUTER SCIENCE AND INFORMATION TECHNOLOGY  
UNIVERSITY OF BALUCHISTAN, QUETTA  
(MID+ TERMINAL)

Paper: Theory of Automata

Time allowed: 120 Minutes

Semester: BS (CS)- 4 (Morning)

Max Marks: 70

Note: Attempt any seven Questions.

Q.1 ✓ Define the following terms. (10)

1. Concatenation
2. Empty string
3.  $\Sigma^*$
4. Palindromes
5. tree ↗

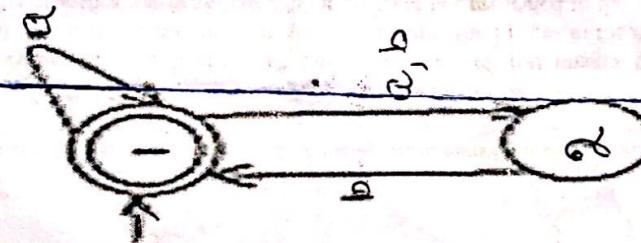
Q.2 ✓ Prove that using Induction Method. (10)

$$\sum_{i=0}^n i = \frac{n(n+1)}{2}$$

Q.3 ✓ (a) What is an AUTOMATA. Define NFA and DFA. (5)

(b) Construct an automaton which accepts all strings having odd number of a's. [  $\Sigma=\{a,b\}$  ] ✓ (5)

Q.4 Convert the following NFA into DFA (10)



Q.5 ✓ (a) Define regular expression (5)

(b) Construct an FA for the following regular expressions (5)

1.  $(1+0)^*1.1.(11+1)^*$
2.  $1^*.2^*.3^*$

Q.6 ✓ Define Finite Automata with output, with the help of examples. (10)

Q.7 (a) Define context free grammar. (5)

(b) Construct grammar for the (5)

1. Odd Palindromes
2. Even palindromes
3. palindromes

Q.8 ✓ Discuss two way finite automata in detail, with examples? (10)