

**First Semester MCA Semester End Examination, JUNE\_JULY\_2023****PYTHON PROGRAMMING**

Time: 3 hrs.

Max. Marks :100

**Instructions:**

1. From Part A answer any FIVE questions and each Question Carries 6 Marks.
2. From Part B answer any ONE full question, from each Module and each Question Carries 10 Marks.
3. From Part C answer any ONE full question and each Question Carries 20 Marks.

**PART A**

L CO PO M

**Instructions: 1. Answer any FIVE full Questions.**

1. If str = "welcome to the world of python programming", show the instructions to perform the following.

- a) print the 10th character of the string
- b) print the index of the first occurrence of the letter 'o' in the string
- c) delete 3rd character of the string
- d) print the length of the string
- e) convert the first word of the string to uppercase
- f) print 16-20th characters of the string

[2] [1] [1] [6]

2. Explain the properties of List, Tuple and Dictionary data structures.

[2] [1] [1] [6]

3. What are classes and objects? Explain the syntax of creating class and objects with a suitable example.

[2] [1] [1] [6]

4. Explain the functions of following tkinter widgets with a suitable example:  
Label, Entry, Button

[2] [1] [1] [6]

5. With a suitable example, explain the working of try-except block.

[2] [1] [1] [6]

6. Demonstrate the concept of for loop with the help of an example.

[2] [1] [1] [6]

7. What are constructors? How to create them? With the help of an example explain the significance of constructors.

[2] [1] [1] [6]

**PART B**

**Instructions: 1. Answer any FIVE full Questions selecting at least ONE Question from Each Module.**

**MODULE 1**

8. Develop a python program for the following and display suitable error message if the condition for input value is not followed.:

- a. Find the factorial of a given Number.
- b. To check whether a given number is prime or not.

[3] [2] [1] [10]

**OR**

9. Develop a python program for the following and display suitable error message if the condition for input value is not followed.:

- a. To reverse a given number and check whether the number is palindrome or not.
- b. Read three numbers and find the largest among them

[3] [2] [1] [10]

## MODULE 2

10. Build regular expressions that matches following words

- a) "bAt", "rat", "cat", "haT"
- b) "laxmi", "Laxmi", "lakshmi"
- c) "agarwal", "Agarwal", "Agrawal", "aggarwal"
- d) "sengupta", "dasgupta"
- e) "colours", "Colours", "Colors"

[3] [2] [5] [10]

OR

11. What are functions? How to define a function? Build a Python program that utilizes a function to display a greeting message, 'Hello! Good Morning,' along with the names of multiple individuals passed as arguments.

[3] [2] [3] [10]

## MODULE 3

12. Create a class student with following member attributes: roll no, name, age and total marks. Create suitable methods for reading and printing member variables. Write a python program to overload '+' operator to count the number of students admitted in the class.

[3] [2] [5] [10]

OR

13. Create a class customer for a bank with following member attributes: Customer\_id, name, age, address and amount of the customer. Write a python program to deposit, withdraw and enquiry in a bank account.

[3] [2] [5] [10]

## MODULE 4

14. What are files? What are different access modes in which you can open a file? Build a python program that accepts filename as an input from the user. Open the file and count the number of times each character appears in the file.

[3] [2] [3] [10]

OR

15. Develop a python program that uses sqlite3 module to perform the following:

- a) Create a database sample.db
- b) Create a table Employee with attributes emp\_id, name, basic\_salary, city
- c) Insert atleast 5 records with appropriate values
- d) Display the emp\_id and names of employees whose basic\_salary is less than Rs. 20000
- e) Display the names of employees who are from Bengaluru

[3] [2] [5] [10]

## MODULE 5

16. Build a Python program which infinitely prints the natural numbers. Raise the Stop Iteration exception after displaying first 20 numbers to exit from the program.

OR

[3] [2] [1] [10]

17. Build a GUI application form using Tkinter which collects two numbers as first number and second number. The form should have Add and Subtract button. Display suitable error messages if the condition for input value is less than 0. It must add or subtract first number and second number, if Add and Subtract button is clicked and display the result in the result text box.

[3] [3] [1] [10]

### PART C

**Instructions :** 1. Answer any ONE full question.

18a. Build a GUI application to design a form for computing the grade of students based on their marks secured in 3 different subjects. The form should have fields for entering these details and a button to compute the grade. Display the result in a label widget. Analyze the significance of using a GUI application for such tasks.

Rules to calculate grade: If average marks secured is below 40, grade="F", if it is in the range of 40-59, grade="SC", if it is in 60-69 range, grade="FC", 70 or above grade="DC". if marks scored in any subject is below 40, grade="F".

[4] [3, 4] [5] [10]

18b. Imagine a situation where you possess a vast amount of contacts and face the task of organizing and accessing information about each contact effectively. This information includes details like the name of the person, contact number, email id. Additionally, you need a fast and convenient way to search for contacts. Analyze which data structure would be most suitable to solve this problem and explain your reasoning with suitable program.

[4] [4] [3] [10]

**OR**

19a. Create a Bank class that possesses attributes such as customer\_id, name, and balance. Implement necessary methods to add & retrieve customer details like name and balance. In this particular scenario, the customer\_id is generated using a separate method instead of the init() function. Examine the potential drawbacks of this approach and compare it with using the init() function to generate customer\_ids.

[4] [4] [3] [10]

19b. Examine the concept of operator overloading and determine whether it allows for the creation of new operators. Justify your conclusion by providing a supportive example that illustrates the capabilities and limitations of operator overloading in Python.

[4] [4] [3] [10]

KLS GOGTE INSTITUTE OF TECHNOLOGY

**First Semester MCA Semester End Examination, JUNE - JULY 2023**

**DATABASE MANAGEMENT SYSTEM**

Time: 3 hrs.

Max. Marks :100

**Instructions:**

1. From Part A answer any FIVE questions and each Question Carries 6 Marks.
2. From Part B answer any ONE full question, from each Module and each Question Carries 10 Marks.
3. From Part C answer any ONE full question and each Question Carries 20 Marks.
4. Draw appropriate diagrams wherever necessary.
5. Any assumptions made should be clearly indicated.

**PART A**

**Instructions: 1. Answer any FIVE full Questions.**

- |   |     |     |     |     |
|---|-----|-----|-----|-----|
| 1. Summarize the characteristics of a database approach.  | [1] | [1] | [1] | [6] |
| 2. Contrast clustered and non-clustered indexes with an example for each.   | [2] | [3] | [1] | [6] |
| 3. Explain with an example for each, the syntax of INSERT and UPDATE commands.  | [2] | [3] | [5] | [6] |
| 4. Explain all the DDL commands with syntax and example for each.   | [2] | [3] | [5] | [6] |
| 5. What are stored routines? Explain stored functions with syntax and write a stored function program to find the area of a circle. | [2] | [3] | [5] | [6] |
| 6. Outline and explain the syntax for creating an explicit cursor in PL/SQL with an example.  | [2] | [3] | [5] | [6] |
| 7. Summarize the desirable properties of a transaction.   | [2] | [1] | [1] | [6] |

**PART B**

**Instructions: 1. Answer any FIVE full Questions selecting at least ONE Question from Each Module.**

**MODULE 1**

8. Make use of mapping to show architecture that separate the user applications and the physical database.

[3] [2] [1] [10]

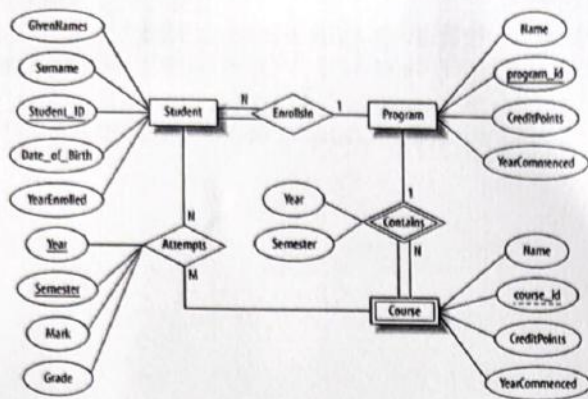
**OR**

9. Distinguish between Data Definition Language, Data Manipulation Language and Data Control Language?

[4] [1] [1] [10]

**MODULE 2**

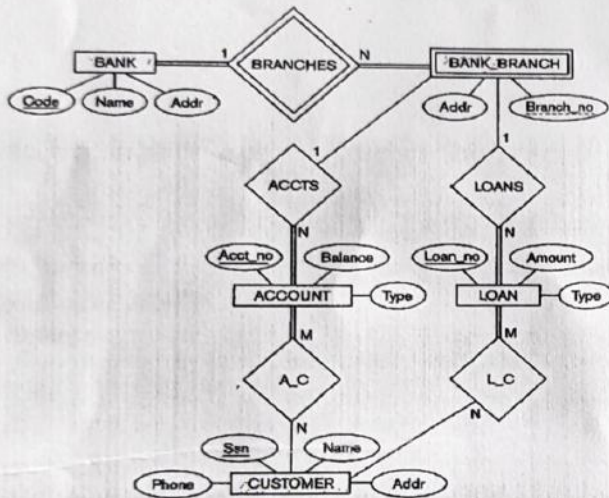
10. Consider the ER diagram in the figure below. Identify and extract from the ER diagram the requirements and constraints that produced this schema. Try to be as precise as possible in your requirements and constraints specification.



[3] [2] [1] [10]

OR

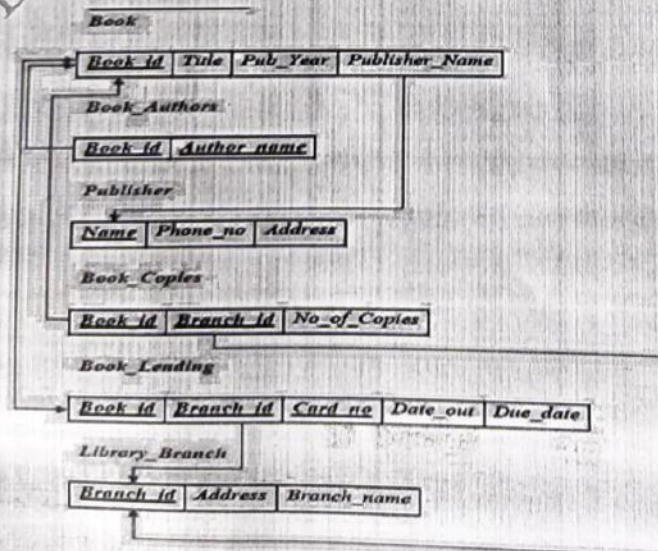
11. Make use of the ER to relational mapping algorithm and map the following ER diagram to a schema diagram. Clearly show the mapping of strong entity types, weak entity types, 1:1, 1:N, M:N and n-ary relationship types.



[3] [2] [1] [10]

### MODULE 3

12. Make use of schema diagram of Library Database and solve the queries.

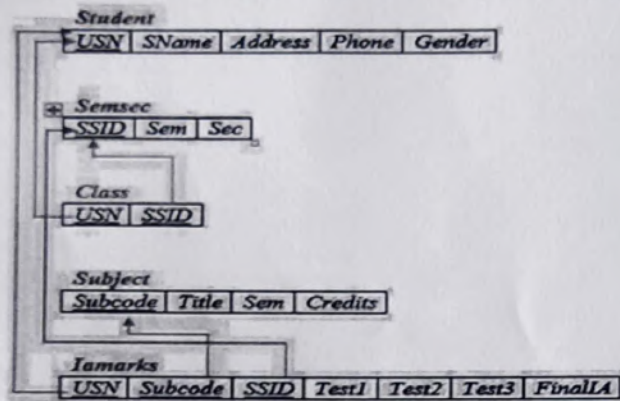


- Retrieve details of all books in the library – id, title, name of publisher, authors and number of copies in each branch
- Get the particulars of borrowers who have borrowed more than 3 books, but from Jan 2017 to Jun 2017
- Create a view of all books and its number of copies that are currently available in the Library.

[3] [3] [1] [10]

OR

13. Analyze the given schema of College Database and solve the following queries.



- List all the student details studying in fourth semester 'C' section.
- Compute the total number of male and female students in each semester and in each section.
- Create a view of Test1 marks of student USN '21MCA121' in all subjects.

[3] [3] [1] [10]

#### MODULE 4

14. Make use of a trigger which will work before deletion in employee table and create a duplicate copy of the record in another table employee\_backup.

[3] [3] [1,5] [10]

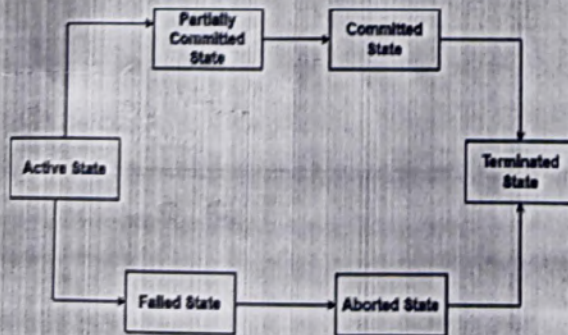
OR

15. Make use of explicit cursors to display employee records from a table. Display appropriate message if the record is not found.

[3] [4] [1,5] [10]

#### MODULE 5

16. Analyze the given state diagram to explain complete process of a transaction with properties of a transaction that should be maintained during the transaction.



[3] [1] [1] [10]

OR

17. Distinguish between Two-phase locking and Timestamp Ordering techniques used in concurrency control.

[4] [1] [1] [10]

## PART C

**Instructions: 1. Answer any ONE full question.**

18a. Scrooge McNugget wants to store information (names, addresses, descriptions of embarrassing moments, etc.) about the many ducks on his payroll. Not surprisingly, the volume of data compels him to buy a database system. To save money, he wants to buy one with the fewest possible features, and he plans to run it as a stand-alone application on his PC clone. Of course, Scrooge does not plan to share his list with anyone. Analyze and indicate which of the following DBMS features Scrooge should pay for; in each case, also indicate why Scrooge should (or should not) pay for that feature in the system he buys.

- A security facility.
- Concurrency control.
- Crash recovery.
- A view mechanism.
- A query language.

[4] [1] [1] [10]

18b. Notown Records has decided to store information about musicians who perform on its albums (as well as other company data) in a database. The company has wisely chosen to hire you as a database designer (at your usual consulting fee of \$2500/day). Each musician that records at Notown has an SSN, a name, an address, and a phone number. Each instrument used in songs recorded at Notown has a unique identification number, a name (e.g., guitar, synthesizer, flute) and a musical key (e.g., C, B-flat, E-flat). Each album recorded on the Notown label has a unique identification number, a title, a copyright date, a format (e.g., CD or MC), and an album identifier. Each song recorded at Notown has a title and an author. Each musician may play several instruments, and a given instrument may be played by several musicians. Each album has a number of songs on it, but no song may appear on more than one album. Each song is performed by one or more musicians, and a musician may perform a number of songs. Each album has exactly one musician who acts as its producer. A musician may produce several albums, of course.

Analyze the given set of requirements and draw an ER diagram for the same that captures the preceding information. Identify the following:

- Strong entity types
- Weak entity types
- Cardinality and Participation constraints.

[4] [2] [1, 3, 5] [10]

### OR

19a. Analyze the following table and answer the questions with proper justification.

UserID	U_email	Fname	Lname	City	State	Zip
MA12	Mani@gmail.com	MANISH	JAIN	BILASPUR	CHHATTISGARH	458991
PO45	Pooja.g@gmail.co	POOJA	MAGG	KACCH	GUJRAT	832212
LA33	Levie98@gmail.com	LAVLEEN	DHALLA	RAIPUR	CHHATTISGARH	853578
CH99	Cheki99@gmail.com	CHIMAL	BEDI	TRICHY	TAMIL NADU	632011
DA74	Danu58@gmail.com	DANY	JAMES	TRICHY	TAMIL NADU	645018

- Is this table in First Normal Form?
- Is this table in Second Normal Form?
- Is it in 3NF? If not, then normalize the table to 3NF.

[4] [4] [1, 3] [10]

19b. Analyze the following table and answer the given questions.

R = (name, street, city, state, postal\_code)

Give a set of FDs for this relation.

Is R in 3NF? 2NF? Explain why?

If R is not in 3NF, normalize it into 3NF relations.

[4] [4] [1, 3] [10]

**First Semester MCA Semester End Examination, JUNE\_JULY\_2023**  
**COMPUTER NETWORKS AND COMMUNICATIONS**

Time: 3 hrs.

Max. Marks :100

Instructions :1.

1. From Part A answer any FIVE questions and each Question Carries 6 Marks.
2. From Part B answer any ONE full question, from each Module and each Question Carries 10 Marks.
3. From Part C answer any ONE full question and each Question Carries 20 Marks.

**PART A**

L CO PO M

Instructions: 1. Answer any FIVE full Questions.

1. Based on the geographical scale categorize the networks and briefly explain their usage. [2] [1] [1] [6]
2. Differentiate Circuit-switched networks and Packet-switched networks. [2] [3] [1] [6]
3. Distinguish between the TCP/IP and OSI reference Model. [2] [1] [1] [6]
4. Define Framing. Explain three types of framing methods with an example. [2] [1] [1] [6]
5. With a neat diagram explain the TCP header format stating the functionality of each bit. [2] [3] [1] [6]
6. Write a brief short note on:
  - a. WWW
  - b. DNS
7. State and explain the different approaches of congestion control. [2] [3] [1] [6]

**PART B**

Instructions: 1. Answer any FIVE full Questions selecting at least ONE Question from Each Module.

**MODULE 1**

8. An image of 1024\*768 pixel 4 bytes/pixel, assume image is uncompressed. Determine how long it takes to transmit it.
  - a. Over 60kbps modem channel.
  - b. Over 1Mbps cable modem
  - c. Over 20Mbps Ethernet.

[3] [1] [1] [10]

**OR**

9. Solve the following:
  - a. Assume that  $SNR_{dB}=40$  and bandwidth of channel is 3MHz. Calculate the channel capacity.
  - b. Consider Noisy channel in which SNR ratio is assumed as zero. Calculate the capacity of the channel.

[3] [1] [1] [10]

**MODULE 2**

10. A message that is to be transmitted is represented by the polynomial  $M(x) = x^5 + x^4 + x$  with a generating prime polynomial  $G(x) = x^3 + x^2 + 1$ . Generate a 3 bit CRC code,  $C(x)$  which is to be appended to  $M(x)$ .

[4] [2] [2] [10]

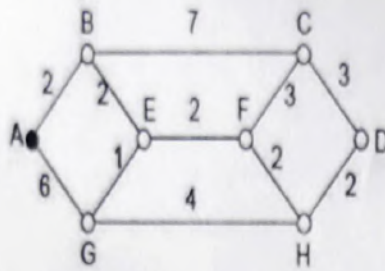
**OR**

11. With a neat transition diagram illustrate how frame transmission is done in case of GOBACK-N. Analyze all cases i.e. normal, ACK loss and Frame loss.

[4] [2] [1] [10]

### MODULE 3

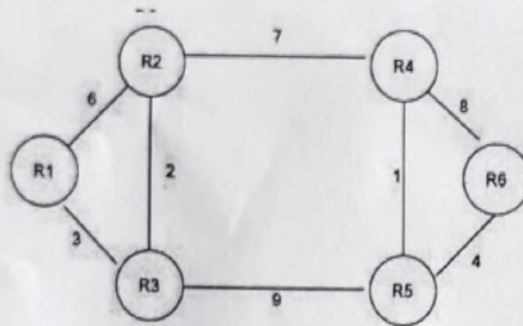
12. Explain and apply the shortest path algorithm to a given graph.



[3] [3] [1] [10]

OR

13. Explain the Link state routing algorithm. Apply the same to the mentioned graph, identify the shortest routing path from Router 1 to Router 6.



[3] [3] [1] [10]

### MODULE 4

14. Illustrate the Scenarios for establishing a connection using a Three-Way Handshake for all the cases with a neat transition state diagram adopting the different cases.

[4] [4] [1] [10]

OR

15. What is the need of Protocols in the Transport layer.

Contrast the services offered by the two major protocols of the TCP and UDP with an example of applications to justify

[4] [4] [1] [10]

### MODULE 5

16. An audio streaming server has a one-way "distance" of 100 m/sec to a media player. It outputs at 1 Mbps. If the media player has a 2-MB buffer, what can you say about the position of the low-water mark and the high-water mark?

[3] [4] [1] [10]

OR

17. Consider a 50,000-customer video server, where each customer watches three movies per month. Two-thirds of the movies are served at 9 P.M. How many movies does the server have to transmit at once during this time period? If each movie requires 6 Mbps, how many OC-12 connections does the server need to the network?

[3] [4] [1] [10]

### PART C

Instructions: 1. Answer any ONE full question.

18. For the algorithm given below, model an appropriate simulation using tcl script.

- a. Create a Simulator object.
- b. Define different colors for the data flows.
- c. Open the nam trace file.
- d. Create four nodes.
- e. Create links between the nodes.
- f. Create a UDP agent and attach it to node n0.
- g. Create a CBR traffic source and attach it to udp0.
- h. Create a UDP agent and attach it to node n1.
- i. Create a CBR traffic source and attach it to udp1.
- j. Create a Null agent (a traffic sink) and attach it to node n3.
- k. Connect the traffic sources with the traffic sink.
- l. Schedule events for CBR agents.
- m. Define a 'finish' procedure.

Run the Simulation.

[3] [4] [5] [20]

OR

19a. The diagram below shows roads connecting towns near to Rochdale. The numbers on each arc represent the time, in minutes, required to travel along each road. Peter is delivering books from his base at Rochdale to Stockport. Use Dijkstra's algorithm to find the minimum time for Peter's journey.



[3] [2] [1] [10]

19b. There are two output files generated when the NS2 simulation code for any scenario is executed. Explain the trace file taking a scenario in the wired communication and explain the different columns which would help in analysing the transmission.

[4] [4] [1] [10]

**First Semester MCA Semester End Examination, JUNE\_JULY\_2023**  
**RESEARCH METHODOLOGY**

Max. Marks : 100

Time: 3 hrs.

Instructions : 1.

1. From Part A answer any FIVE questions and each Question Carries 6 Marks.
2. From Part B answer any ONE full question, from each Module and each Question Carries 10 Marks.
3. From Part C answer any ONE full question and each Question Carries 20 Marks.

**PART A**

L CO PO M

Instructions : 1. Answer any FIVE full Questions.

- |   |     |     |     |     |
|---|-----|-----|-----|-----|
| 1. Outline the meaning of research. List the research objectives.   | [2] | [1] | [1] | [6] |
| 2. Illustrate the conditions that must be met for a research problem to exist.  | [2] | [1] | [1] | [6] |
| 3. Explain the place of a literature review in research and list the functions of a literature review.  | [2] | [2] | [2] | [6] |
| 4. Illustrate the following important concepts relating to research design:<br>a) Dependent and Independent Variables<br>b) Extraneous variable<br>c) Research Hypothesis | [2] | [2] | [3] | [6] |
| 5. Illustrate the characteristics of the secondary data which the researchers must pay attention to before using them as a mark of caution and why is it essential?       | [2] | [1] | [1] | [6] |
| 6. Outline tables and it's parts as a method of presenting analyzed data.   | [2] | [1] | [1] | [6] |
| 7. Summarize the need for intellectual property rights.   | [2] | [1] | [1] | [6] |

**PART B**

Instructions: 1. Answer any FIVE full Questions selecting at least ONE Question from Each Module.

**MODULE 1**

- |   |     |     |     |      |
|---|-----|-----|-----|------|
| 8. Make use of a neat flowchart for research process steps. | [3] | [3] | [3] | [10] |
|---|-----|-----|-----|------|

**OR**

- |  |     |     |     |      |
|--|-----|-----|-----|------|
| 9. Organize the points to be observed by a researcher in selecting a research problem. | [3] | [1] | [1] | [10] |
|--|-----|-----|-----|------|

**MODULE 2**

- |  |  |  |  |  |
|--|--|--|--|--|
| 10. List the steps involved in conducting a literature review. |  |  |  |  |
|--|--|--|--|--|

Consider the paragraph: "The author recently examined, as part of an evaluation study, the extent of practice of the concept of 'community responsiveness' in the delivery of health services in Western Australia by health service providers. Before evaluating the extent of its use, pertinent literature relating to 'community responsiveness in health' was identified and reviewed."

Identify the themes that have emerged from this review, which can be considered as the basis of developing the theoretical framework for the study.

[3] [2] [2] [10]

**OR**

- |   |     |     |     |      |
|---|-----|-----|-----|------|
| 11. Illustrate the need for research design. Analyze the design decisions and the parts of the overall research design. | [4] | [1] | [1] | [10] |
|---|-----|-----|-----|------|

### MODULE 3

12. Identify any two methods for primary data collection with its merits and demerits.

[3] [3] [3] [10]

OR

13. List all the complex random sampling design and Consider a situation where a population is divided into three strata so that  $N_1 = 5000$ ,  $N_2 = 2000$  and  $N_3 = 3000$ . Respective standard deviations are:  $\sigma_1=15$ ,  $\sigma_2=18$  and  $\sigma_3=5$ . Apply disproportionate sampling design for optimum allocation to obtain a sample of size of  $n = 84$  from the three strata.

[3] [3] [3] [10]

### MODULE 4

- 14a. Define the most popular averages.

Make use of the following numbers to calculate the geometric mean :4, 6, and 9

[3] [4] [4] [7]

- 14b. Make use of the following data (given as X) along with frequencies to calculate the mean:

X (Score)	Frequency
10	1
5	3
8	2
2	5
4	5

[3] [4] [4] [3]

OR

- 15a. Illustrate mean deviation.

Make use of the following data to calculate the mean deviation from the mean:

57, 64, 43, 67, 49, 59, 44, 47, 61, 59

[3] [4] [4] [5]

- 15b. Illustrate standard deviation.

Make use of the following data to calculate the standard deviation:

4, 2, 5, 8, 6

[3] [4] [4] [5]

### MODULE 5

16. Classify the various kinds of intellectual property rights in detail.

[4] [1] [1] [10]

OR

17. Select the following conventions and explain them in detail

- Berne Convention
- WIPO Convention

[3] [1] [1] [10]

### PART C

Instructions: 1. Answer any ONE full question.

- 18a. Examine the problems encountered by researchers in India

- 18b. Analyze the following concepts relating to research design:

[4] [1] [1] [8]

- Experimental and non-experimental hypothesis-testing research
- Experimental and control groups
- Treatments
- Experiment and Experimental Unit(s)

[4] [1] [4] [12]

OR

19a. Examine the following graph types for graphic presentations of analyzed data and make use of table data to plot the corresponding graphs:

- i) The histogram (Table1)
- ii) The bar graph (Table2)
- iii) The pie chart (Table3)

Table1:

Height (in cm)	40-45	45-50	50-55	55-60	60-65
Number of boys	12	18	15	9	8

Table2:

The favourite color of 200 kids in a class					
Favourite Colours	Red	Green	Blue	Yellow	Orange
Number of Students	45	17	50	48	40

Table3

Favorite type of Movies			
Comedy	Action	Romance	Drama
4	5	6	1

[4] [4] [4] [10]

19b. Examine systematic sampling design highlighting its positive and negative aspects.

Suppose a local NGO is seeking to form a systematic sample of 500 volunteers from a population of 5000. Identify the steps that the NGO would prefer to use to set up the systematic random sample.

[4] [1] [1] [10]

KLS GOGTE INSTITUTE OF TECHNOLOGY

**First Semester MCA Semester End Examination, JUNE\_JULY\_2023****MATHEMATICAL FOUNDATIONS**

Time: 3 hrs.

Max. Marks :100

**Instructions:**

1. From Part A answer any FIVE questions and each Question Carries 6 Marks.
2. From Part B answer any ONE full question, from each Module and each Question Carries 10 Marks.
3. From Part C answer any ONE full question and each Question Carries 20 Marks.
4. Draw neat diagram wherever asked.
5. Calculator is allowed.

**PART A****Instructions: 1. Answer any FIVE full Questions.**

- |  | L   | CO  | PO  | M   |
|--|-----|-----|-----|-----|
| 1. Define Proposition, Tautology and Contradiction with an example for each.                                     | [2] | [1] | [1] | [6] |
| 2. Explain quantifiers and their types with an example.  | [2] | [1] | [1] | [6] |
| 3. Define any three types of function with an example for each.  | [2] | [1] | [1] | [6] |
| 4. Outline the differences between correlation and regression analysis.  | [2] | [1] | [1] | [6] |
| 5. Give Binomial distribution probability mass function and list the conditions for using binomial distribution. | [2] | [1] | [1] | [6] |
| 6. Discuss why Konigsberg seven bridge problem has no solution.  | [2] | [1] | [1] | [6] |
| 7. Define semigraph. Illustrate applications of the semigraph.   | [2] | [1] | [1] | [6] |

**PART B****Instructions: 1. Answer any FIVE full Questions selecting at least ONE Question from Each Module.****MODULE 1**

8. Determine the Eigen values and Eigen vectors of the following matrix:

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

[5] [2] [1] [10]

**OR**

9. Develop

- a) a direct proof
- b) an indirect proof and
- c) proof by contradiction for the following statement:  
" If n is an odd integer, then n+9 is an even integer"

[3] [3] [1] [10]

**MODULE 2**

- 10a. For
- $A = \{1,2,3,4\}$
- and
- $R = \{(1,1), (1,2), (2,3), (3,3), (3,4)\}$
- is a relation on A. Make use of composition of relations and find
- $R^2$
- and
- $R^3$
- and draw their digraphs.

[3] [2] [1] [5]

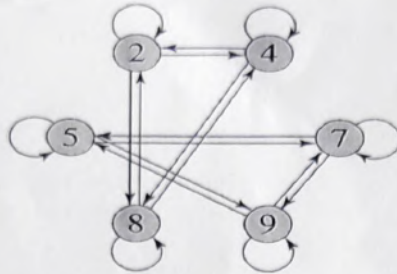
- 10b. Let
- $A = \{1,2,3,4,6,8,12\}$
- and R be the partial ordering on A defined by
- $aRb$
- if a divides b, then

- i) Draw the Hasse Diagram of the poset(A,R)
- ii) Determine the relational matrix for R.

[3] [2] [1] [5]

OR

11a. From the given diagram identify the elements of relation R. Also verify which properties of relation are satisfied?



11b. Consider the functions f and g defined by  $f(x)=x^3$  and  $g(x)=x^2+1$ . Identify  $g \circ f$ ,  $f \circ g$ ,  $f^2$  and  $g^2$ .

[3] [2] [1] [5]

[3] [2] [1] [5]

### MODULE 3

12. Consider the following series of marks secured by 10 students in a class test in Mathematics and Statistics:

Marks in Mathematics: 45, 70, 65, 30, 90, 40, 50, 75, 85, 60.

Marks in Statistics: 35, 90, 70, 40, 95, 40, 60, 80, 80, 50

- Determine Karl Pearson's coefficient of correlation. Assume 60 and 65 as working means.
- Calculate its probable error.
- Hence analyze if the value of r is significant or not. Also compute the limits within which the population correlation coefficient may be expected to lie.

[4] [4] [1] [10]

OR

13. Utilize the data given below to determine:

- The two regression coefficients.
- The two regression equations.
- The coefficient of correlation between the marks in Economics and Statistics.
- The most likely marks in Statistics when marks in economics are 30.

Marks in Economics: 25, 28, 35, 32, 31, 36, 29, 38, 34, 32.

Marks in Statistics: 43, 46, 49, 41, 36, 32, 31, 30, 33, 39.

[4] [4] [1] [10]

### MODULE 4

14a. Identify the probabilities of the following, if 4 cards are drawn from the pack of playing cards, what is the probability that,

- all cards are from same suit
- 2 are red and 2 are black

[3] [2] [1] [5]

14b. In a certain tournament, the probability of A's winning a game is  $\frac{2}{3}$ . Find the probability of A's winning at least 4 games out of 5.

[3] [2] [1] [5]

OR

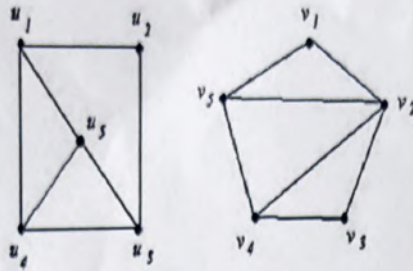
15. Find the following probabilities using standard normal distribution table,

- $P(0 < Z < 1.14)$
- $P(Z > 2.78)$
- $P(Z < -2.02)$
- $P(-2.45 < Z < 1.14)$

[3] [2] [1] [10]

### MODULE 5

16. Construct Adjacency matrix of the following graphs and check whether they are isomorphic.



[3] [4] [1] [10]

OR

17a. Illustrate chromatic number of a graph.

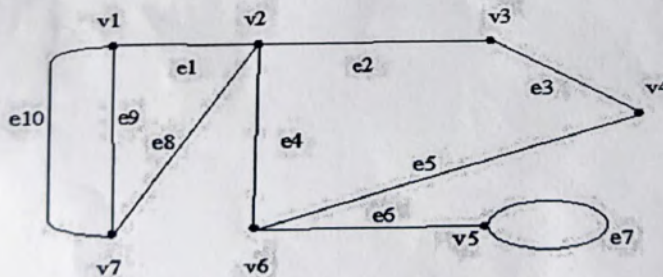
Also Identify the chromatic number of the following graphs:



[4] [2, 3] [1] [5]

17b. Identify the following from the below graph:

- Closed walk
- Open walk
- Path
- Circuit
- length of walk/ Path/ Circuit



[3] [4] [1] [5]

### PART C

18. Analyze the given information about soil fertility index and urea fertilizer used per 100 square meter area.

Urea Fertilizer used per 100 sq meter area in kg	165	150	210	180	90	190	170	125
Soil fertility index	5	5.5	3.25	5	6.35	3.4	5.25	6.25

- using suitable method check the correlation coefficient and give remarks.
- using suitable method verify whether the correlation coefficient is significant or not.
- Estimate the soil fertility index if 80kg of urea fertilizer is used per 100 square meter area.

Also analyze the given information:

	Soil fertility index		
	Red and Yellow soil	6.1 – 6.5	3.5-4.0
Forest soil	5.5 – 6.0	3.5-4.0	<3.0
Saline and alkaline soil	5.1 – 5.5	3.0-3.5	<3.0
Remarks	Ecologically productive	Commercially productive	Towards less fertile

d) Identify what should be the maximum amount of urea fertilizer can be used per 100 sq meter area to avoid less fertile of forest soil.

e) Identify the range amount of urea fertilizer can be used to maintain the ecologically productive nature of Red and Yellow soil.

[4] [3] [3] [20]

OR

19. Analyze the given scenario and give solution in parts as mentioned.

Following are the various points in city. Also the distance between them and delay caused by traffic.

Note that if the distance to some point is not mentioned then no such connection exist.

Sl. No.	Point	Point	Distance	Delay in minutes
1	CBT	RTO	2.5km	2
2	CBT	H Circle	5km	0
3	CBT	Camp	4km	1
4	CBT	Goaves	3.5km	2
5	RTO	Camp	3km	0
6	RTO	Goaves	6km	0
7	Angol Naka	Camp	5.5km	0
8	Angol Naka	Goaves	3km	0
9	Angol Naka	Udyambag	2km	2
10	Angol Naka	H Circle	7km	1
11	Udyambag	Goaves	3.2km	0
12	Udyambag	Camp	3 km	0
13	Udyambag	RTO	5.2km	2

a. Identify vertices and edges from the above information and Represent the above information in Graph.

b. Find the cycle and total distance covering all the roads exactly once starting from point CBT. Also name the concept of graph theory used.

c. Find the closed walk covering all the points exactly once and also give total distance travelled. Name the suitable concept of graph theory applied.

d. If the delay of 2 minutes is equivalent to covering 1.5 km of distance, then if the closed walk found in iv (previous point) contains total delay more than or equal to 2 then calculate total distance by substituting 2 min of delay as 1.5 km.

e. Also find the optimised closed walk possibly avoiding delay in it.

[4] [4] [3] [20]

**First Semester MCA Semester End Examination, JUNE\_JULY\_2023**  
**BASICS OF PROGRAMMING LANGUAGES BRIDGE COURSE**

Time: 3 hrs.

Max. Marks :100

**Instructions:**

1. From Part A answer any FIVE questions and each Question Carries 6 Marks.
2. From Part B answer any ONE full question, from each Module and each Question Carries 10 Marks.
3. From Part C answer any ONE full question and each Question Carries 20 Marks.

**PART A****L CO PO M****Instructions: 1. From Part A answer any 5 questions each Question Carries 6 Marks.**

1. Explain the syntax of switch case statement in C. Also compare the performance of switch case with if else statement. [2] [1] [1] [6]
2. Explain how are arrays processed in C? Illustrate 2-Dimensional arrays with an example. [2] [1] [1] [6]
3. What is function overloading? Explain with an example. [2] [4] [3] [6]
4. What is use of continue statement in C? Explain with an example. [2] [1] [1] [6]
5. Explain with a proper example "functions with no arguments" and with "return values" in C? [2] [2] [1] [6]
6. Explain the following concepts in C with an example for each:
  - a. Structure
  - b. Union[2] [2] [1] [6]
7. Define polymorphism. Explain the working of polymorphism in C++. [2] [4] [3] [6]

**PART B****Instructions: 1. Answer any FIVE full Questions selecting at least ONE Question from Each Module.****MODULE 1**

8. Using switch statement build a C program to design a calculator. [3] [2] [1] [10]

**OR**

9. Develop a C program to find the product of two matrices. [3] [2] [1] [10]

**MODULE 2**

10. Develop a C program to sort an array of integers in ascending order using user-defined functions. [3] [2] [1] [10]

**OR**

11. Develop a C program using structure to store the records of 20 students in a class. [3] [2] [1] [10]

**MODULE 3**

12. Make use of the dynamic memory allocation operations with proper syntax. [3] [2] [1] [10]

**OR**

13. Develop a C program to exhibit the concept of
  - a) Passing address to function
  - b) Passing pointers to function[3] [2] [1] [10]

#### MODULE 4

14. Construct a class in C++ called `Software_Engg` which contains attributes like Name, age, department\_name, total\_experience, and salary. Insert at least two records for each attribute, read the data, and display the same.

[3] [4] [3, 5] [10]

OR

15. Define classes and objects. Build a C++ code to demonstrate the working of constructor and destructor.

[3] [4] [3, 5] [10]

#### MODULE 5

16. List all the types of inheritance and build a C++ program to exhibit any 2 types of inheritance.

[3] [4] [3, 5] [10]

OR

17. Define polymorphism and build a C++ program to demonstrate function overloading.

[3] [4] [3] [10]

#### PART C

Instructions: 1. From Part C answer any one full question and each Question Carries 20 Marks.

18. Analyze and develop a C program for the income tax of 5 employees, attributes such as the name of the employee, designation, department, and annual salary are given below as per the following slab rate:

Below 5 lakhs:	No tax
Above 5 lakhs and below 7 lakhs:	10% tax on annual income
Below 10 lakhs:	20% tax on annual income
Above 10 lakhs:	30% tax on annual income

Calculate the annual salary based on the above slab rate and print the desired output.

[4] [2] [1] [20]

OR

19. Analyze the case study where in a smartphone manufacturing company called **Micromax** has different variants of smartphone models such as **Micromax A1**, **Micromax Nano**, **Micromax S1** and **Micromax Z1**. Every smartphone contains different attributes such as

**Micromax A1:** Battery 10,000 mAh, Network type 4G/5G, Price 45000/- Screen size 11 inch, Warranty 1 year.

**Micromax Nano:** Battery 5000 mAh, Network type 4G/5G, Price 35000/- Screen size 10 inch, Warranty 1 year.

**Micromax S1:** Battery 5000 mAh, Network type 4G, Price 15000/- Screen size 11 inch, Warranty 0.5 year.

**Micromax Z1:** Battery 4000 mAh, Network type 4G/5G, Price 25000/- Screen size 11 inch, Warranty 1 year.

Using inheritance concept, Build the C++ code to demonstrate the working of inheritance and print the desired attributes listed above for different variants of smartphone models.

[4] [4] [3, 5] [20]