

Enrolment No.

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MCA 2<sup>nd</sup> Semester End Term Examination- 2022

DATABASE MANAGEMENT SYSTEM

Paper Code: PCA02C09

Full Marks: 50

Time: 2 Hours

The figures in the margin indicate full marks for the questions

(Answer to all the questions)

Group - A

1. Answer to the following questions:

(5 x 2) = 10

- a) What is Super key and Candidate key?  
 b) What is immediate and inplace update?  
 c) Write down the SQL query for the following statement:  
 $\pi_{FNAME, LNAME, STATE}(\sigma_{DNO=6}(STUDENT))$   
 d) What are the transaction boundaries?  
 e) Why concurrency control is required?

Group - B

2. a) Why recovery is required? Explain different types of transaction failure.  
 b) Explain ACID properties of a transaction.  
 c) What is transaction log? What are the typical kinds of records in a transaction log?

(4+3+3)=10

3. a) How a transaction moves through its execution states? Illustrate with a suitable diagram.  
 b) Why Concurrency Control is needed?  
 c) Explain incorrect summary problem and lost update problem with example.

(4+2+4)=10

Group - C

4. a) Convert the following table into 3NF (Show all steps).

5

Proj_num	Proj_name	Emp_num	Emp_name	Designation	Charge/hour	Total_hr
Proj_01	ORS	101	David	Engineer	450	10
		102	Shane	Clarke	380	7
		105	Scott	Driver	300	12
Proj_02	LMS	103	Smith	Programmer	450	11
		104	Dale	Developer	430	10
		108	Scott	Teacher	400	12

b)

Table: - stud

Stud_id	Stud_name	State	rank
1001	Ram	MP	103
1105	Sachin	Bihar	109
2006	Rahul	WB	1811
3017	Rakesh	MP	151
1015	Pradip	Bihar	312
4123	Akash	WB	531

Table: - adm

Stud_id	Allot_nit	Cat	Admit
1001	NITT	OPEN	YES
1105	NITT	OBC	YES
2006	NITA	OPEN	NO
3017	NITW	SC	YES
4123	NITA	ST	YES

Write SQL query with output (where applicable) for the following statements:

(5x3=15)

- a) Show allot nit, rank and cat of all the students.
- b) Show all details of students who got admission.
- c) Find max rank who took admission in NITA.
- d) List the no of students who take admission in each NIT.
- e) Remove the record from stud table that does not taken admission.



MCA 2<sup>nd</sup> Semester End-Term Examination 2017  
GRAPH THEORY AND COMBINATORICS  
MCA02C07

Total Marks:-100

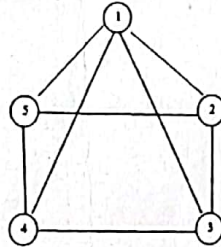
Time: 3:00 hrs

Attempt all the questions.

1. a) Define the following with example/diagram.

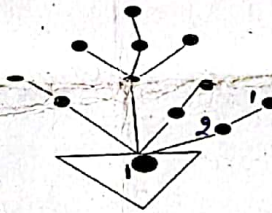
- i) Bipartite Graph
- ii) Covering Number
- v) Relation Matrix
- vii) Graph Fusion

- ii) Complete Matching
- iv) Path Matrix
- vi) Circuit Matrix
- viii) Counting Tree

b) Find the chromatic polynomial from the given graph and also evaluate it for  $\lambda = 4$ .

$$[(8 \times 3) + 6 = 30]$$

2. a) Use generating function and partition to verify the recurrence relation of the following rooted unlabeled tree:



b) Given 4 cubes whose 6 faces are coloured with R, B, G, and Y. 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.

	B	
Y	R	G
	R	
	R	

	B	
Y	Y	G
	R	
	B	

	B	
G	Y	R
	B	
	G	

	B	
R	Y	G
	Y	
	R	

$$[5 + 5 = 10]$$

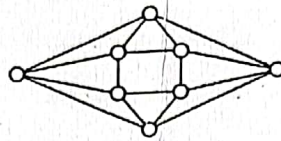
3. a) Find out the geometric dual of the given graph and verify the relation between vertices, edges and regions between the two.

b) What is the relation between  $A_f$ ,  $B_f$  and  $C_f$ ?

$$[5 + 5 = 10]$$

P.T.O.

4. a) What is the minimum no. of colours required to colour the following graph? On the basis of the chromatic number of the given graph define and show Independent Set, Maximal Independent Set, Largest maximum independent set and Independence Number.



3 1 1 1 1 1

b) Discuss any four important property of an Incidence Matrix.

[6 + 4 = 10]

5. a) Show that a Regular Graph is Complete but a Complete Graph is not Regular.

b) Suppose in an interview four applicants A, B, C and D are there for seven positions p<sub>1</sub>, p<sub>2</sub>, p<sub>3</sub>, p<sub>4</sub>, p<sub>5</sub>, p<sub>6</sub> and p<sub>7</sub>. The eligibility criteria are as follows:

A → p<sub>1</sub>, p<sub>2</sub>, p<sub>5</sub>    B → p<sub>1</sub>, p<sub>2</sub>, p<sub>3</sub>, p<sub>5</sub>, p<sub>7</sub>    C → p<sub>1</sub>, p<sub>2</sub>    D → p<sub>2</sub>, p<sub>5</sub>

is it possible to hire all the applicants and assign each a job? If no, then how many maximum applicants can be hired?

[3 + 7 = 10]

6. a) Discuss five Counting Principles with proper example.

b) Differentiate between Isomorphism and 1-Isomorphism with suitable diagram.

[5 + 5 = 10]

7. a) Minimize the following switching function using covering concept:

$$f = A'B'CD' + A'B'C'D' + ABCD + A'BCD + A'BCD' + A'B'CD + AB'C'D'$$

b) Name five situations which can be represented using graphs and also mention what vertices and edges will represent in each situation.

[5 + 5 = 10]

8. a) Discuss the steps to detect planarity.

b) Show the ring sum of two cut set is either a third cut set or an edge disjoint union of two cut sets.

c) Show that every tree with two or more vertices is 2-chromatic.

[4 + 3 + 3 = 10]

	a	b	c	d	e	f	g	h
a	1	0	0	0	0	0	0	0
b	0	1	0	0	0	0	0	0
c	0	0	1	0	0	0	0	0
d	0	0	0	1	0	0	0	0
e	0	0	0	0	1	0	0	0
f	0	0	0	0	0	1	0	0
g	0	0	0	0	0	0	1	0
h	0	0	0	0	0	0	0	1



Enrolment No. 21MCA029

MCA 2<sup>nd</sup> Semester End-Term Examination, 2022  
Subject: - OBJECT ORIENTED PROGRAMMING  
Paper Code: - PCA02C11

Total Marks:-50

Time: 2:00 hours

Attempt all the questions

GROUP A - 10 Marks

1. Why a friend function cannot be used to overload '=' operator? [2]
2. How does object-oriented approach differ from object based approach? [2]
3. Demonstration the use of 'new' operator in object creation. [2]
4. Define an abstract class with appropriate syntax. [2]
5. Show the use of 'this' pointer with syntax. [2]

GROUP B - 20 Marks

6. a) How does a main() function in C++ differ from the main() in C program? [2]  
b) What are the different access specifier/ visibility mode? [3]
7. a) What are the two ways that a member function of a class can be defined? [2]  
b) Mention different types of Inheritance with diagram. [3]
8. Write a program to input five subject marks for five students and show the total marks and average of marks for each student by using array of objects concept. [5]
9. Can we have multiple constructors in a class? Explain such a situation with a programming example. [5]

GROUP C - 20 Marks

10. a) Explain the concept of friend function and operator overloading. [2 + 2]  
b) Write a program to show the use of friend function to overload a binary operator. [6]
11. a) Create a base class 'shape' with two data members to compute the area of a figure and derive two classes from it as 'triangle' and 'rectangle'. Create two functions as input() and output() to take the input data members and display the area of figures respectively. Make output() as a virtual function in 'shape' and redefine it in the derived classes as per requirement. Based on all these data, create a C++ program that will accept the dimensions of a triangle and rectangle respectively and display their area.  
[area of rectangle =  $a*b$  and area of triangle =  $\frac{1}{2}*a*b$ ] [7]  
b) Differentiate between early binding and late binding. [3]

Enrolment No.   

Full Marks: 50

Symbols used here have their usual meanings

Time: 2 hours

GROUP-A

Answer all the questions:

Marks: 10

1. Give one example of each discrete and continuous random variable.
2. Is every uncorrelated random variables are independent? Justify. *Yes*
3. What is stationary point and saddle point?
4. Find out the characteristic equation of  $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$ .
5. Solve the difference equation  $u_{n+2} - 4u_{n+1} + 4u_n = 0$ .
6. Define consistency and inconsistency of the system of linear equations.

[1+2+2+1+2+2]=10

GROUP-B

Answer all the questions:

Marks: 20

1. A) Find the Eigen values and the corresponding Eigen vectors of the Matrix  $A = \begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$ .

B) Solve:  $(D^2 + 3D + 2)y = e^{e^x}$  *general form*

2. A) Investigate for which values of  $\lambda$  and  $\mu$ , the system of equations
 
$$\begin{aligned} x + 4y + 2z &= 1, \\ 2x + 7y + 5z &= 2\mu, \\ 4x + \lambda y + 10z &= 2\mu + 1 \end{aligned}$$

will have (i) no solution, (ii) a unique solution and (iii) an infinite number of solution.

B) Solve the difference equation,  $u_{x+2} - 8u_{x+1} + 25u_x = 2x^2 + x + 1$ .GROUP-C

Answer all the questions:

Marks: 20

1. A) State Euler's theorem and hence find the value of  $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} + z \frac{\partial u}{\partial z}$ , if  $u = \sin^{-1} \left( \frac{x+2y+3z}{x^8+y^8+z^8} \right)$ .

B) Show that the rectangular solid of maximum volume that can be inscribed in a sphere is a cube, by Lagrange's multiplier.

[5+5=10]

2. A) There are six hundred Economics students in the post-graduate classes of a university, and the probability for any student to need a copy of a particular book from the university library on any day is 0.05. How many copies of the book should be kept in the university library so that the probability may be greater than 0.90 that none of the students needing a copy from the library has to come back disappointed? *732*

B) In a partially destroyed laboratory, records of an analysis of correlation data, the following results only are legible:

Variance of  $X = 9$ ; Regression equations:  $8X - 10Y + 66 = 0$  and  $40X - 18Y = 214$ .

- Find (i) the mean values of  $X$  and  $Y$ . *13, 17*  
 (ii) the correlation coefficient between  $X$  and  $Y$ .  $\rightarrow$  *(3/5)*  
 (iii) the standard deviation of  $Y$ . *4*

[5+5=10]

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TABLE FOR AREAS UNDER THE STANDARD NORMAL CURVE



z	0	1	2	3	4	5	6	7	8	9
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0754
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
0.6	.2258	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2518	.2549
0.7	.2580	.2612	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2996	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990
3.1	.4990	.4991	.4991	.4991	.4992	.4992	.4992	.4992	.4993	.4993
3.2	.4993	.4993	.4994	.4994	.4994	.4994	.4994	.4995	.4995	.4995
3.3	.4995	.4995	.4995	.4996	.4996	.4996	.4996	.4996	.4996	.4997
3.4	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4998
3.5	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998
3.6	.4998	.4998	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999
3.7	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999
3.8	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999
3.9	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000



Enrolment No. 

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**MCA 2<sup>nd</sup> Semester End-Term Examination, 2022**  
**Subject: - GRAPH THEORY AND COMBINATORICS**  
**Paper Code: - MCA02C10**

**Time: 2:00 hours**

**Total Marks:-50**

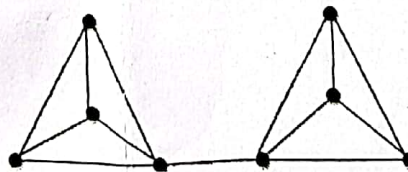
**Attempt all the questions**

**GROUP A – 10 Marks**

1. "All complete graphs are regular but not all regular graphs are complete"- explain why? [2]
2. Define "Handshaking dilemma" with appropriate diagram. [2]
3. Draw a suitable graph and find the following from it:  
a) Directed walk      b) Semi path [2]
4. Define Series edges with appropriate diagram. [2]
5. Why parallel edges are not allowed in adjacency matrix? [2]

**GROUP B – 20 Marks**

6. a) What is fundamental cut set and how is it formed? [3]  
b) Differentiate between block and component. [2]
7. a) A connected graph has 9 vertices having degrees 2, 2, 2, 3, 3, 3, 4, 4 and 5. Determine the number of edges and regions in that graph. [2]  
b) Define thickness and crossing. [3]
8. a) Discuss the properties of  $K_5$  and  $K_{3,3}$  graphs. [4]  
b) What is a cut vertex? [1]
9. a) Draw the Geometric Dual of the following graph. [2]



- b) Define Path Matrix with appropriate diagram. [3]

**P.T.O.**



Enrolment No. 

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S<sub>2</sub>(PCA02C13) MCA

MCA 2nd Semester Mid Term Examination- 2022

Name of Subject: Computer Organization and Architecture

Paper Code: PCA02C13

Full Marks: 20

Time: 1 Hour

[The figures in the margin indicate full marks for the question]

**Group A: Very Short Questions (1 mark each)**

(1X4=4)

- 1) Express IEEE standard double-precision floating-point format.
- 2) Define MDR.
- 3) Explain Array Multiplier.
- 4) List the Types of shift Micro operation.

**Group B: Short Questions (2 marks each)**

(2X4=8)

- 5) Is there any alternative to von-Neumann architecture? Justify your answer.
- 6) Compare Computer organization and Computer architecture?
- 7) Classify the computer level hierarchy with proper examples.
- 8) Show the memory transfer function in RTL.

**Group C: Descriptive Questions (4 marks each)**

(4X2=8)

- 9) Design Hardware Implementation of following controlled Transfer with Timing Diagram:

P:  $R2 \leftarrow R1$

- 10) Calculate the signed binary multiplication of (+3) and (-4) using Booth's Algorithms.

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Handwritten calculations for Booth's Algorithm:  
Multiplying (+3) and (-4).  
(+3) = 0100  
(-4) = 1100  
Result = 11100 (which is -4 in decimal)



MCA 2<sup>nd</sup> Semester Mid-Term Examination, 2022  
Subject: - OBJECT ORIENTED PROGRAMMING  
Paper Code: - PCA02C11

Time: 1:00 hour

Total Marks:-20

Attempt all the questions

GROUP A

[1 X 4 = 4]

1. What is the drawback of 'keyword'?
2. Define "encapsulation".
3. What do you mean by 'namespace std'?
4. What is 'manipulator' in C++?

GROUP B

[2 X 4 = 8]

5. In which situations 'Inline' functions might not work?
6. Differentiate between a 'Reference variable' and a 'Pointer'.
7. Explain 'enum' data type with suitable example.
8. What do you mean by 'function prototyping'?

GROUP C

[4 X 2 = 8]

9. Create a class bank\_account with the data members as: name of account holder, account type, account balance and member functions as: input() to take input towards each data member. Also create a private member function: deposit() to deposit money in the account. Display all details with the help of object from the class.
10. Discuss the various 'Storage Classes' in C++.

Marks Division

Question	1	2	3	4	5	6	7	8	9	10
Marks	1	1	1	1	2	2	2	2	4	4



Enrolment No.

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S4(PCA02C09)CSE

MCA 2<sup>nd</sup> Semester Mid Term Examination- 2022

Name of Subject: Database Management System

Paper Code: PCA02C09

Full Marks:20

Time: 1 Hours

The figures in the margin indicate full marks for the questions

Attempt all the questions

1. a) What do you mean by Database System?

(1\*4)=4

b) Define OLTP?

c) Who are the workers behind the scene of DBMS?

d) Give examples of user-defined operations of DBMS.

2. a) What are the different types of Database?

(2\*4)=8

b) Explain the categories of Database Users.

c) What are the differences between Database Schema, Instance &amp; State?

d) Discuss the categories of data models.

3. a) Explain main Characteristics of the Database Approach?

(4\*2)=8

b) Table name: products

ProductID	ProductName	SupplierID	CategoryID	Unit	Price
1	Chais	1	1	10 boxes	18
2	Chang	1	1	24 bottles	19
3	Aniseed Syrup	1	2	550 ml	10
4	Cajun Seasoning	2	2	48 jars	22
5	Aumibo Mix	2	3	36 boxes	18
6	Boysenberry Spread	3	2	12 jars	25

Write SQL statement for the followings:

- Write SQL statement to create the above table.
- Find out the product details those are under supplierID '1' and categoryID '2'.
- Insert following row in the above table:

ProductID	ProductName	SupplierID	CategoryID	Unit	Price
7	Crocin	3	1	20 boxes	85