

(3 hours)

Total marks: 100

Note:

1. Q1 is compulsory
2. Attempt any Four from remaining Six questions

- Q.1(a) Explain different types of inheritance supported by C++ with examples of each. 10
- (b) Explain the use of 'new' and 'delete' operators. Explain their role in dynamic memory management. 10
- Q.2(a) Explain operator overloading. Write a program to overload relational operator. 10
- (b) Discuss the role of Constructors in a C++ program. Also explain the use of parameterized constructors with example. 10
- Q.3(a) What is a friend function? What is the need of friend function? Write a program to illustrate a class as a friend of another class. 10
- (b) Explain the difference between – 10
- 1) Function Overloading and Function Overriding
 - 2) Associative and Sequence Containers
- Q.4(a) What are manipulators? Explain different manipulators with suitable examples. 10
- (b) Write a program to convert distance from meter to centimeter and centimeter to meter using object to object conversion. 10
- Q.5(a) Discuss the process of Exception Handling in C++ with suitable examples. 10
- (b) What is a template? Illustrate the use of class template with a suitable example. 10
- Q.6(a) What is polymorphism? Explain how polymorphism can be achieved during runtime. 10
- (b) Declare a class employee with emp_id, name, dept, salary. Write a program to access the object of employee class into and from binary file 10
- Q.7 Write a short note on **any four** of the following: 20
- a) Data Types in C++
 - b) Namespaces
 - c) this pointer
 - d) command line arguments
 - e) default argument

(Old)

(3 Hours)

Q. P. Code: 22967

[Total marks:100]

- Note (1) Q1. is compulsory, attempt any four out of remaining.
 (2) All question carry equal marks.
 (3) Answer to sub-questions should be grouped together.

- Q1.** (a) Design an E-R diagram for keeping track of the exploits of your favorite sports team. You should store the matches played, the scores in each match, the players in each match and individual player statistics for each match. Summary statistics should be modeled as derived attributes. 10
 (b) Write schema definition and normalize all tables in 3NF for the above ER diagram. 10
- Q2.** (a) Write a detailed note on query optimization. 10
 (b) Explain architecture of database system. What are roles and responsibilities of a DBA? 10
- Q3.** (a) What are different levels of data independence? Explain in detail. 10
 (b) What is deadlock? Describe and compare deadlock detection and prevention techniques. 10
- Q4.** Differentiate between the following 20
 (a) Relational and network model
 (b) Strong and weak entity
 (c) structure and hash indexing
 (d) Ternary Relationship in E-R diagram and aggregation
- Q5.** (a) What is bell la pedula model? Explain in detail. 10
 (b) Define decomposition. Explain loss less and dependency preserving decomposition. 10
- Q6.** (a) What is an index on a file? What is search key for an index? Why do we need indexes? 10
 (b) What is transaction? Explain ACID properties. 10
- Q7.** Write short note on **any four** of the following 20
 (a) triggers
 (b) crash recovery and checkpoints
 (c) shadow paging
 (d) MVD
 (e) super and candidate keys

(Time: 3 Hours)

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- N.B. : 1) Question No.1 is **compulsory**.
2) Attempt any **four** from the remaining **six** questions.
3) Figures to the right indicate full marks.

- Q1. (a) Explain OSI model and compare it with the TCP/IP. [10]
(b) Discuss RSA public key cryptosystem with example. [10]
- Q2. (a) Explain the 3-way handshake for TCP connection [10]
(b) Explain Ipv4 Header format in detail. [10]
- Q3. (a) What is Classful addressing? Discuss Class A, Class B, Class C, Class D and Class E addresses with its ranges in decimal dotted notation and example. [10]
(b) Describe the IEEE 802.3 and IEEE 802.5 standards for communication. [10]
- Q4. (a) What is congestion? Discuss various methods of preventing and reducing the congestion. [10]
(b) Explain GEO, MEO and LEO categories of satellite. [10]
- Q5. (a) Explain the operation of CSMA/CD .Discuss various Persistent algorithm used. [10]
(b) What is the need of Routing Algorithm? In which layer it is implemented? Discuss Shortest Path Routing Algorithm. [10]
- Q6. (a) Explain the concept sliding window Protocol .What is the difference between Go Back N ARQ and Selective Repeat ARQ. [10]
(b) Explain DES cipher Algorithm in detail. [10]
- Q7. Write Short notes on any **four** of the following: [20]
(a) Tunneling
(b) FTP
(c) ICMP
(d) DNS
(e) ARP
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Time: 3 hours

Marks: 100

- Note:
- Question 1 is compulsory
 - Answer any 4 from the remaining 6 questions
 - Figures to the right indicate marks
 - Use of scientific calculator is allowed

Q1 a) Solve the Following Problem using Graphical Method [10]

$$\begin{aligned} \text{Maximize } Z &= 3X_1 + 2X_2 \\ \text{Subject to } 2X_1 + X_2 &\leq 40 \\ X_1 + X_2 &\leq 24 \\ 2X_1 + 3X_2 &\leq 60 \\ \text{and } X_1, X_2 &\geq 0 \end{aligned}$$

b) Suppose the following estimates of activity times (days) are provided [10]

Activity	Optimistic time	Most time	Likely	Pessimistic time
1-3	1	3		5
1-2	3	4		5
3-5	4	5		6
2-4	3	5		7
4-5	5	6		13
5-6	4	7		10
4-6	6	8		10

- Draw a network
- Find the expected duration and variance for each activity.
- Find the critical path of the project

Q2 a) Write short notes on the following. [10]

- Different costs associated with inventory problem.
- Redundant constraints in LPP.

b) The data collected in running a machine, the cost of which is Rs.60,000 are given below: [10]

Year	1	2	3	4	5
Resale Value (Rs.)	42000	30000	20400	14400	9650
Cost of spare(Rs.)	4000	4270	4880	5700	6800
Cost of labour(Rs.)	14000	16000	18000	21000	25000

Determine the optimum period of replacement of the machine?

- Q3 a) Solve the following LPP by Simplex Method

Maximize $Z = 4x_1 + 10x_2$

Subject to $2x_1 + x_2 \leq 10$

$2x_1 + 5x_2 \leq 20$

$2x_1 + 3x_2 \leq 18$

$x_1, x_2 \geq 0$

[10]

- b) 6 jobs are to be processed at three machines A, B and C in the order ABC. The time taken by each job on the three machines is given below. Each machine can process one job at a time. Determine the optimal sequence of jobs and the minimum total elapsed time. Find the idle time of each machine.

[10]

Jobs	A	B	C
1	8	3	8
2	3	4	7
3	7	5	6
4	2	2	9
5	5	1	10
6	1	6	9

- Q4 a) Reduce the game by dominance property and solve

[10]

		Player B				
		I	II	III	IV	V
Player A	I	1	3	2	7	4
	II	3	4	1	5	6
	III	6	5	7	6	5
	IV	2	0	6	3	1

- b) Using two-phase method solve the following LPP

[10]

Maximize $Z = 2x_1 + 3x_2 - 5x_3$

subject to $x_1 + x_2 + x_3 = 7$

$2x_1 - 5x_2 + x_3 \geq 10$

and $x_1, x_2, x_3 \geq 0$

- Q5 a) Solve the following assignment problem and find the optimum assignment that will result in minimum man hours needed. [10]

		Jobs			
		A	B	C	D
Workers	I	5	3	2	8
	II	7	9	2	6
	III	6	4	5	7
	IV	5	7	7	8

- b) Find the initial basic feasible solution using Vogel's Approximation Method (VAM) for the following transportation problem. [10]

		Distribution Centre				
		A	B	C	D	Supply
Plant	1	2	3	11	7	6
	2	1	0	6	1	1
	3	5	8	15	9	10
	Requirement	7	5	3	2	

- Q6 a) Solve the following LPP using Big M method [10]

Maximize $Z = 3x_1 + 2x_2$

Subject to

$$2x_1 + x_2 \leq 1$$

$$3x_1 + 4x_2 \geq 4$$

And

$$x_1, x_2 \geq 0$$

- b) Draw the network diagram. Find total, free and independent floats. [10]

Activity	1-2	1-3	1-4	2-4	2-5	3-6	4-6	5-7	6-7	6-8	7-8	8-9
Duration	4	12	10	8	6	8	10	10	0	8	10	6

- Q7 a) Use the dual simplex method to solve the following problem. [10]

Minimize $Z = x_1 + 2x_2 + 3x_3$

Subject to $2x_1 - x_2 + x_3 \geq 4$

$x_1 + x_2 + 2x_3 \leq 8$

$x_2 - x_3 \geq 2$

$x_1, x_2, x_3 \geq 0$

- b) Solve using Gomory's cutting plane method [10]

Maximize $Z = 7x_1 + 9x_2$

subject to $-x_1 + 3x_2 \leq 6$

$7x_1 + x_2 \leq 35$

and $x_1, x_2 \geq 0$ and x_2 is integer