(3 Hours) **[Total Marks 80]**

i. Q. 1. is Compulsory.
ii. Attempt any three from the remaining.
iii. Assume suitable data.

Q 1

a	Explain Data Independence		**5**
b	Explain Recursive queries and Nested queries		**5**
c	What are different Keys in ER diagram?		**5**
d	Explain Join Operations in relational algebra		**5**

Q 2

a	Explain different indexing types in database management system		**10**
b	Explain need of Normalisation along with all the normal forms		**10**

Q 3

a Consider the following employee database. **10**

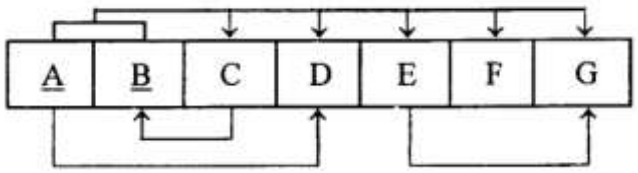
- **Employee(empname, street, city, date_of_joining)**
- **Works(empname, company_name, salary)**
- **Company(company_name, city)**
- **Manages(empname, manager_name)**

Write SQL queries for the following statements:

1. Modify the database so that employee "Amruta" now leaves in "Konkan"
2. Find number of employees in each city with date_of_joining as "01-Aug-2017"
3. list name of companies starting with letter "A"
4. Display empname , manager_name , street , city only for employees having manager

b Explain in detail different database users **10**

Q 4 **a** Construct a dependency diagram of relation R and normalize it up to the BCNF Normal form **10**



b Explain different types of operators in relational algebra **10**

Q 5

a	Explain the difference between stored procedure and functions in SQL	**10**
b	Draw EER diagram for Library Management System showing aggregation.	**10**

Q 6 **Write a short note on:**

a	Specialization and Generalization	**5**
b	DCL commands	**5**
c	Cursors and its types	**5**
d	Hashing techniques	**5**

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(3 Hours) **[Total Marks: 80**

N.B.: (1) Question No. **1** is **compulsory.**
(2) Solve any **three** questions out of remaining **five.**
(3) Figures to **right** indicate **full** marks.
(4) Assume suitable **data** where **necessary.**

Q1. Solve any four **20**
a) Prove that NOR gate is a universal gate.
b) Convert following decimal number to Binary ,Octal, Hexadecimal and Gray code $(2538)_{10}$
c) Derive relation between α and β.
d) Design full adder using half adder and additional gates.
e) Covert D flip flop to T flip flop.

Q2. a) Explain Voltage Divider Biasing Circuit with its stability factor. **10**
b) Using Quine MC Cluskey Method determine Minimal SOP form for **10**
$$F(A,B,C,D)= \sum m(0,1,3,7,8,9,11,15)$$

Q3. a) Implement following using only one 8:1 Multiplexer and few gates.
$$F(A,B,C,D)= \sum m(0,1,3,4,5,7,9,10,12,15)$$ **10**
b) With neat logic diagram explain operation of 4-bit Bidirectional Shift Register. **10**

Q4. a) Design a Mod 12 asynchronous counter using J-K Flipflop. **10**
b) Minimize the following four variable logic function using K-map **10**
i) $f(A,B,C,D)=\sum m(0,1,3,4,7,9,11,13,15)$
ii) $f(A,B,C,D)=\pi M(0,2,5,6,10,12,13.14)$

Q5. a) Simplify following equation using Boolean algebra and Design using basic gates **10**
i) $(A + B)(A + C)$
ii) $(A + C)(AD + \overline{AD}) + AC + C$

b) Explain VHDL program format and write VHDL program for NAND gate. **10**

Q6 Solve any four- **20**
a) 3-bit binary to Gray code conversion.
b) Working of Master slave J-K flip flop.
c) Explain working Current Mirror Circuit.
d) Write VHDL program for Half Subtractor circuit.
e) Explain working of 3:8 Decoder.

Q.P. Code: 24574

Time: 3 Hours **Marks: 80**

N.B (1) Question No. 1 is compulsory

(2) Out of remaining questions attempt three

(3) Figures to right indicate full marks.

Q1 Solve any **four**

a) Compare ground wave & sky wave propagation **(5)**
b) Define modulation & explain any two need of modulation **(5)**
c) State in brief different types of noise. **(5)**
d) With reference to receiver define sensitivity, selectivity, fidelity and image frequency rejection **(5)**
e) Draw BASK & BFSK signal for 10111010. **(5)**

Q2 a) Explain with neat diagram Indirect method of FM generation **(10)**

b) Prove Friss formula with reference to noise factor in cascade. **(10)**

Q3 a) What is multiplexing in communication system? Explain in brief transmitter and receiver of FDM. **(10)**

b) A sinusoidal carrier has an amplitude of 20 V & frequency of 200 Khz. It is amplitude modulated by a sinusoidal voltage of amplitude 6 V & frequency 1 Khz. Modulated voltage is developed across a 80 Ω resistance 1. Write the equation of modulated wave 2. Determine modulation index 3. Draw the spectrum of modulated wave & 4. Calculate total average power. **(10)**

Q4 a) Explain generation & demodulation of PWM. **(8)**

b) In an AM receiver the loaded Q of antenna circuit at the input to mixer is 100. Calculate image frequency & its rejection at 1 MHz. **(8)**

c) State in brief different types of communication channel **(4)**

Q5 a) Explain delta modulator transmitter & receiver with neat block diagram **(10)**

b) State & prove following properties of Fourier transform.

(i) Time shifting (ii) convolution in time domain **(10)**

Q6 Write short notes (**Any Four**) **(20)**

1. Sampling theorem
2. Frequency spectrum allocation
3. Tropospheric scatter propagation
4. Inter symbol interference
5. Noise figure & noise factor

(Time: 3 Hours) **[Total Marks: 80]**

N.B.: (1) Question No.1 is compulsory.

(2) Attempt **any three** out of remaining questions.

(3) Assume Suitable data if necessary.

(4) **Figures** to the **right** indicate full **marks**.

1.	(a)	What are the applications of Stack?	3
	(b)	What are the advantages of circular linked list?	3
	(c)	Differentiate between space complexity and time complexity.	3
	(d)	Explain linear and non linear data structures.	2
	(e)	What is expression tree? Give Example.	3
	(f)	Explain asymptotic notations.	3
	(g)	What is recursion? State its advantages and disadvantages.	3
2.	(a)	Write an algorithm for converting infix to postfix expression.	10
	(b)	Explain BFS and DFS algorithm with examples.	10
3.	(a)	Write an algorithm for following operations on singly linked List (1)Insertion (2)Deletion (3)Traversal	10
	(b)	Write an algorithm for implementing stack using array.	10
4.	(a)	Explain the properties of Binary search tree. Construct Binary search tree for following elements: **47,12,75,88,90,73,57,1,85,50,62**	10
	(b)	Explain Quick sort using an example. Write algorithm for it and comment on its complexity.	10

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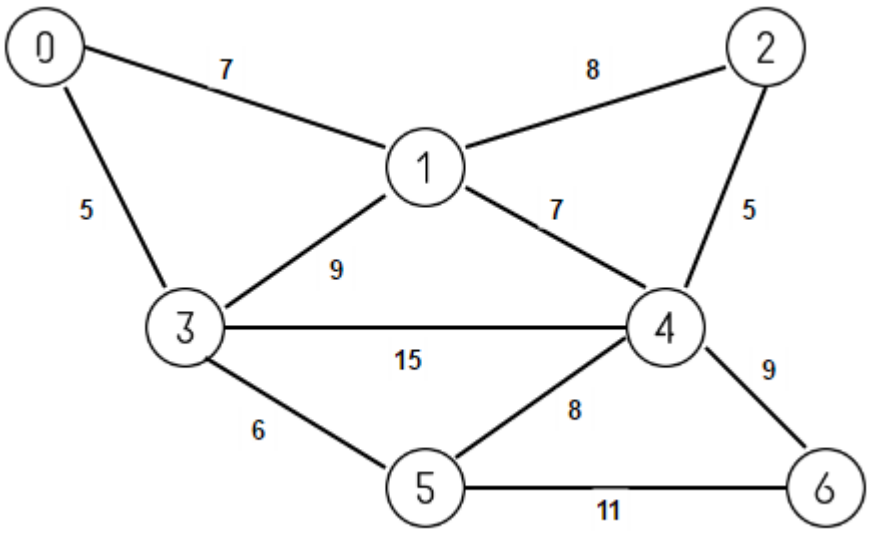
5. (a) What is collision? What are the methods to resolve collision? Explain Linear probing with an example. 10

   (b) Write an algorithm for merge sort and comment on its complexity. 10

6. (a) Write an algorithm for implementing Queue using array. 10

   (b) What is Minimum Spanning Tree? Draw the MST using kruskal's and prim's algorithm and find out the cost with all intermediate steps. 10



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