



Q.P. Code : 23178

[Time: Three Hours]

[Marks:80]

Please check whether you have got the right question paper.

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

- a) If the Laplace transform of $\sin^2 3t$ 20
- b) Prove that $f(z) = \log z$ is analytic
- c) Obtain Fourier series for $f(x) = x^2$ in $(-2,2)$
- d) Find the Z-Transform of $\cos 2k, k \geq 0$

- a) Prove that $\vec{F} = 2xyz^3\mathbf{i} + x^2z^3\mathbf{j} + 3x^2yz^2\mathbf{k}$ is irrotational.
 Find Scalar potential for \vec{F} 06
- b) Find the inverse Laplace Transform using Convolution theorem 06

$$\frac{1}{(s^2+6s+10)^2}$$
- c) Find Fourier Series of $f(x) = \frac{\pi-x}{2}$ in $(0,2\pi)$. 08
 Hence deduce that $\frac{\pi}{4} = 1 - \frac{1}{3} + \frac{1}{5} - \dots$
- a) Find the Analytic function $f(z) = u + iv$ if $u + v = \cos x \cosh y - \sin x \sinh y$ 06
- b) Find Inverse Z transform of $\frac{2z^2-10z+13}{(z-3)^2(z-2)}$, $2 < |z| < 3$ 06
- c) Solve the Differential Equation $\frac{d^2y}{dt^2} + 2 \frac{dy}{dx} y = 3te^{-t}$, $y(0) = 4, y'(0) = 2$ using Laplace Transform 08

- a) Find the Orthogonal Trajectory of $x^2 + y^4 - 3xy + 2y = c$ 06
- b) Using Greens theorem evaluate $\int_C (x^2 - y)dx + (2y^2 + x)dy$, C is closed path formed by $y = 4, y = x^2$ 06

Q.P. Code : 23178

- c) Express the function $f(x) = \begin{cases} \sin x; & 0 < x \leq \pi \\ 0 & ; x > \pi \end{cases}$ as Fourier Integral. Hence evaluate $\int_0^{\infty} \frac{\cos(\lambda\pi/2)}{1-\lambda^2} d\lambda$ 08

Q.5

- a) Find Inverse Laplace Transform of $\frac{2s^2-6s+5}{s^3-6s^2+11s-6}$ 06
- b) Find the Bilinear Transformation that maps the points $z = 1, i, -1$ into $w = i, 0, -i$ 06
- c) Evaluate using Stoke's theorem $\int_c \vec{F} \cdot d\vec{r}$ where c is the boundary of the circle $x^2 + y^2 + z^2 = 1, z = 0$ and $\vec{F} = yz\mathbf{i} + zx\mathbf{j} + xy\mathbf{k}$ 08

Q.6

- a) Find the Directional derivative of $\phi = x^2 + y^2 + z^2$ in the direction of the line $\frac{x}{3} = \frac{y}{4} = \frac{z}{5}$ at $(1, 2, 3)$ 06
- b) Find complex form of Fourier series for $e^{ax}; (-\pi, \pi)$ 06
- c) Find Half Range sine Series for $f(x) = x(2-x)$ $0 < x < 2$ 08
hence deduce that $\sum \left(\frac{1}{n^2}\right) = \frac{\pi^6}{945}$

N.B.1) Question no 1 is compulsory.

2) Figures to the right indicate full marks.

3) Attempt any three from Q2 to Q5.

- Q1 a) If any 14 integers from 1 to 26 are chosen then show that at least one of them is a multiple of another. 05
- b) Functions f and g are defined as follows : 05
 $f: \mathbb{R} \rightarrow \mathbb{R}$, $g: \mathbb{R} \rightarrow \mathbb{R}$ $f(x) = 2x + 3$, $g(x) = 3x - 4$.
 Find $f \circ g$ and $g \circ f$.
- c) $L\left(\frac{d}{dt} \frac{\sin 3t}{t}\right)$. 05
- d) Show that there does not exist an analytic function whose real part is $3x^2 - 2x^2y + y^2$. 05
- Q2 a) Evaluate $\int_0^{\infty} e^{-t} \left(\frac{\cos 3t - \cos 2t}{t}\right) dt$ 06
- b) Evaluate $L^{-1}\left\{\frac{s}{(s^2+1)(s^2+4)(s^2+9)}\right\}$ 06
- c) Find bilinear transformation which maps the points $Z=1, i, -1$ into points $W=i, 0, -i$. Hence find fixed pts of transformation and the image of $|z| < 1$. 08
- Q3 a) If A, B, C are of subsets of universal set U , then prove that 06
 $A \times (B \cup C) = (A \times B) \cup (A \times C)$
- b) Let $A = \{1, 2, 3, 6\}$, $B = \{1, 2, 3, 6, 7, 14, 21, 42\}$ and R be the relation 'is divisible by'. 06
 Draw Hasse Diagram for two sets. Show that are posets.
- c) Find Laplace transform of following functions. 08
 (i) $e^{-2t} \sqrt{1 - \sin t}$ (ii) $te^{-2t} H(t-1)$

Q4 a) In how many different ways can 4 ladies and 6 gentlemen be seated in a row, so no ladies sit together. 06

b) Find analytic function whose real part is 06

$$\frac{\sin 2x}{\cos h2y + \cos 2x}$$

c) Evaluate inverse Laplace Transform of following functions 08

(i) $\frac{1}{(s-3)(s+4)^2}$ by convolution theorem (ii) $\log\left(1 + \frac{a^2}{s^2}\right)$

Q5 a) Solve the following equation by using Laplace transform 06

$$\frac{dy}{dt} + 2y + \int_0^t y dt = \sin t, \text{ given that } y(0) = 1$$

b) Find p such that the function $\frac{1}{2} \log(x^2 + y^2) + i \tan^{-1} \frac{px}{y}$ is analytic. 06

c) For $x, y \in \mathbb{Z}$, xRy if and only if $2x + 5y$ is divisible by 7 08
is R an equivalence relation? Find equivalence relation.

Q6 a) Each coefficient of the equation $ax^2 + bx + c = 0$ is determined by throwing an ordinary die. Find the probability that the equation will have real roots. 06

b) A certain test for particular cancer is known to be 95% accurate. A person submits to the test and result is positive. Suppose that a person comes from a population of the 1,00,000 where 2000 people suffer from disease. What can we conclude about the probability that person under test has particular cancer? 06

c) i) If five points are taken in a square of side 2 units. Show that at least two of them are no more than $\sqrt{2}$ units apart. 04

ii) How many friends must you have to guarantee that at least five of them have their birthday in same month. 04

29/11/2017

Q. P. Code: 25270

Time: 3 hours

Marks: 80

N.B: 1. Question No 1 is compulsory

2. Answer any four from the remaining.

1. Answer any four from the following.

(20M)

- (a) Explain any one type of wireless communication channel.
- (b) State and prove time shifting property of Fourier transform.
- (c) How the selectivity and sensitivity will be improved in super heterodyne receiver as compare to TRF receiver.
- (d) Explain Inter symbol Interference and how to study ISI.
- (e) Explain Time division multiplexing.

2. (a) Derive the expression for Friss formula.

(5M)

(b) State and prove convolution property of Fourier transform.

(5M)

(c) Derive the expression for AM and also draw the envelope of the AM for different modulation indexes.

(10 M)

3. (a) Explain Ratio detector with neat diagram.

(10 M)

(b) Explain generation and degeneration of DSBSC AM.

(10 M)

4. (a) Explain Generation and degeneration of PWM.

(10 M)

(b) Explain Adaptive delta modulation in detail.

(10 M)

5. (a) Explain generation and degeneration of BFSK signal.

(10 M)

(b) The binary data 11101101 is transmitted over a baseband channel. Draw the waveform for transmitted data using the following data formats.

(10 M)

(i) Unipolar NRZ

(ii) Unipolar RZ

(iii) Bipolar RZ

(iv) Split phase Manchester

(v) Polar Quaternary NRZ for M= 4.

6. Write a short note on any four

(20M)

(i) Sampling theorem

(ii) Thermal Noise and Noise Temperature

(iii) BASK generation

(iv) SSB SC AM generation method

(v) Need for modulation.

29/11/2017

Q.P. Code: 24572

(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
- Prove that NOR gate is a universal gate.
 - Convert following decimal number to Binary, Octal, Hexadecimal and Gray code $(2538)_{10}$
 - Derive relation between α and β .
 - Design full adder using half adder and additional gates.
 - Convert 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. 10
 $F(A,B,C,D) = \sum m(0,1,3,4,5,7,9,10,12,15)$
 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
- $f(A,B,C,D) = \sum m(0,1,3,4,7,9,11,13,15)$
 - $f(A,B,C,D) = \pi M(0,2,5,6,10,12,13,14)$
- Q5. a) Simplify following equation using Boolean algebra and Design using basic gates 10
- $(A+B)(A+C)$
 - $(A+C)(AD+\bar{A}D)+AC+C$
- b) Explain VHDL program format and write VHDL program for NAND gate. 10
- Q6. Solve any four- 20
- 3-bit binary to Gray code conversion.
 - Working of Master slave J-K flip flop.
 - Explain working Current Mirror Circuit.
 - Write VHDL program for Half Subtractor circuit.
 - Explain working of 3-8 Decoder.

Q. P. Code: 22955

(3 hours)

[80 marks]

NOTE: Question No 1 is compulsory

Attempt any three questions from remaining. Assume suitable data if necessary.

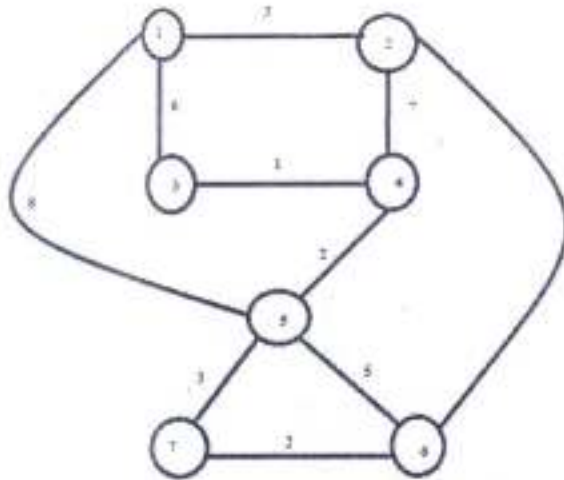
Figure indicate full marks

- Q1. A) Define Data structure and Abstract Data Type? 2
- B) What do you mean by asymptotic notations? Explain with the help of example. 3
- C) What is recursive function? Explain how it works using proper example. 3
- D) Define Stack? List the applications of Stack? 3
- E) List the properties of Red-Black Tree. 3
- F) Define Graph. What are the methods to represent graph? 3
- G) What is Linked List? State the advantages of Linked List. 3
- Q2. A) Write a program to implement Queue using array. 10
- B) Illustrate the deletion operation in a binary heap with examples. 10
- Q3. A) Write an algorithm for Quick sort and Merge sort. 10
- B) Define AVL Tree? Create an AVL tree using the following sequence
(Mention type of rotation for each case.)- 16,27,9,11,36,54,81,63,72 10
- Q4. A) Write a functions to implement insert (), delete () and traverse ()
for singly linked list. 10
- B) Write a program to implement a Stack ADT using Linked List? 10



TURN OVER

Q5. A) Find Minimum spanning tree for following graph using Prim's and Kruskal's Algorithm. Show all the steps. 10



B) From a binary max-heap and min-heap from the following sequence of data-
50,40,35,25,20,27,33 10

Q6. Write Short note (Any Four) 20

- a. Euclid's Algorithm
- b. Huffman tree
- c. Sparse matrix
- d. Breadth First Search Algorithm
- e. Circular Queue
- f. Bubble Sort

Q. P. Code: 24476

(Time: 3 Hours)

{Total Marks: 80}

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

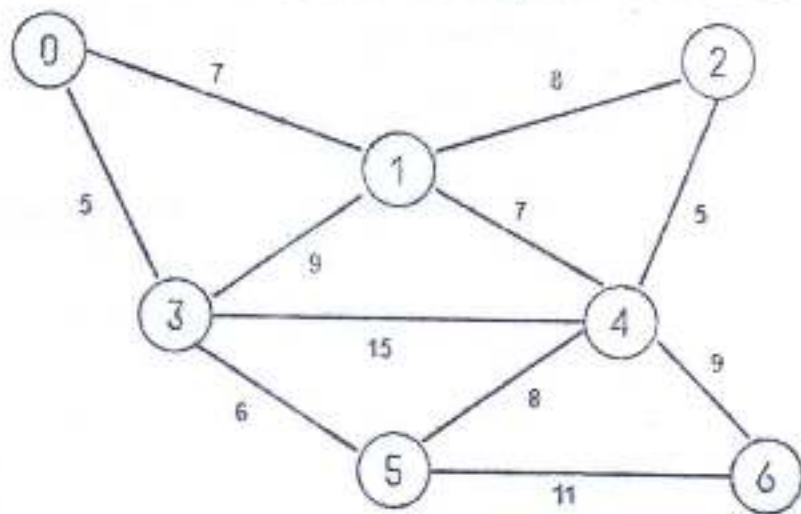
(2) Attempt **any three** out of remaining questions.

(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 |

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



Q. P. Code: 26352

(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
- State ideal and Practical Characteristics of an Op-amp
 - Explain Multiplexer and Demultiplexer.
 - Convert following decimal number to Binary, Octal, Hexadecimal and Gray code
 i) $(128)_{10}$ ii) $(73)_{10}$
 - Explain working of LCD.
 - Convert D flip flop to S-R flip flop.
- Q2. a) Implement following using only one 8:1 Multiplexer and few gates. 10

$$F(A,B,C,D) = \sum m(0,1,3,4,5,8,9,10,12,15)$$
- b) Explain Fixed Biasing Circuit with its stability factor. 10
- Q3. a) Draw and Explain Instrumentation Amplifier using Op-amp. 10
- b) Draw circuit diagram and explain the operation of Monostable Multivibrator using IC555. 10
- Q4. a) Minimize the following four variable logic function using K-map and design by using basic gates 10

$$f(A,B,C,D) = \sum m(0,1,2,3,4,7,8,9,11,15)$$
- b) What are the different methods used to improve CMRR in Differential Amplifier. Explain one in brief. 10
- Q5. a) Design a Mod 12 asynchronous counter using J-K-flip flop 10
- b) Design 4-bit binary to gray code conversion 10
- Q6 Write short notes on any four 20
- Explain the working of a Non-inverting amplifier using Op-amp
 - Explain working of a transistor.
 - Write VHDL program for NAND gate.
 - Explain working of Current Mirror Circuit.
 - Explain block diagram of op-amp.

(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 |
| | <ul style="list-style-type: none"> • Employee(empname, street, city, date_of_joining) • Works(empname, company_name, salary) • Company(company_name, city) • Manages(empname, manager_name) | |

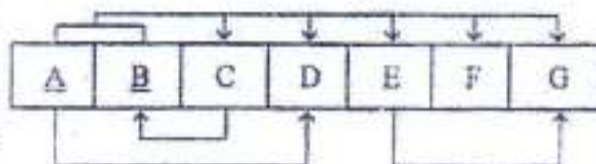
Write SQL queries for the following statements:

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 |

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

Mark 80

3 hrs

Note:

Question 1 is compulsory

Solve any three of the remaining.

Draw neat diagrams

- Q1. a) Identify and list down file operations (5)
 b) Describe ACID Properties (5)
 c) Explain Total participation and partial participation with example (5)
 d) Explain aggregate Function with example (5)
- Q2. a) Explain stored procedure and functions with example (10)
 b) Explain Shadow Paging (10)

- Q3. a) Identify and list all functional dependencies satisfied by the relation (10)

X	Y	Z
1	4	2
1	5	3
2	6	3
3	7	2

- b) Explain ER Model into Relational Model Conversion with example. (10)
- Q4. a) Describe view in SQL with example (10)
 b) Explain any 2 concurrency protocols in database systems (10)
- Q5. a) List various types of constraints in database? Explain any two (10)
 b) Explain cost based query optimization (10)
- Q6. a) Explain deadlock with wait-for-graph (10)
 b) Explain conflict and view serializability with example (10)

N.B 1) Question no. 1 is compulsory.

2) Attempt any three from remaining questions.

Q.1 a What role does "interface" play in multiple inheritance. Explain with example. [10]

Demonstrate use of interface to achieve polymorphism with example.

b Differentiate between abstract class and interface [5]

c Create a method size(Object z), that accepts a single refernce argument, z. If z [5]

refers to "Rectangle" then size(z) returns its area, and if z is a refernce to a "Cube" then size(z) returns its volume. If z refers to an object of any other class, then size(z) returns -1.

(Hint: Use instanceof operator)

Q.2 a Explain different types of relationships among entities. [10]

Define the relationships among the objects of given sentences:

1) Employee works on project.

2) Customer places order.

3) WebOrder, TelephoneOrder is a kind of order.

b What is the advantage of clause "finally" [10]

List any 2 exceptions defined in java. Explain use of try, catch and use of multiple catch block.

Q.3 a Create class Student (roll number, name). [10]

Class Test (mark1, mark2) inherit student class.

Create interface Sport with data member as sports_mark and method set_sportMark().

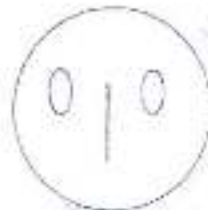
Create class Result which extends Test and implements Sport and has a method named calculate which finds total as (total=marks1+marks2+sports_mark) and method which display all the details.

Create an object of Result class and show result.



Q .P. Code : 26234

- b What is a class? How does it accomplish data hiding? What is the need of a constructor? [10]
- Q.4 a Explain access specifiers in JAVA. Can all methods of a class be private? [10]
- b Which are the two different ways to create a thread? Write a multithreaded program to show inter-leaving of actions from 2 threads and display ABABABABABABAB [5]
- c Write an applet program to display [5]



- Q.5 a Explain different features of JAVA. [10]
- b Write a program to perform following operations on vector [10]
1. To add city name to vector
 2. To remove city name from vector
 3. To display all city name
- Q.6 a Write a program to create a Package College with class Student and Marks [10]
- Create class Student with data member as roll_num and Name. Accept the value from the user in getdata() and display it in putdata()
- Create class Marks that inherits Student with data member as marks (It is array accepting marks for 5 different subject). Accept the Marks in getdata() , Calculate the sum of marks display result of student in putdata() based on percentage (if ≥ 90 display Merit if ≥ 75 and < 90 Distinction if ≥ 60 and < 75 First class)
- Create class Demo with Main function, create the object of the appropriate class and display the result for 2 different students.
- b Explain System.arraycopy() method with example. [5]
- c Differentiate between Array and Vector. [5]
