Analog and Digital
Circuits.

QP Code : 30720

(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** wherever **required**.

     (4)   Draw appropriate **waveforms** wherever **required**.

1.   Solve **any five** :
   - (a)   CE configuration is popular in amplifier circuits. Justify.   4
   - (b)   Explain the working of zener diode as voltage regulator.   4
   - (c)   State ideal and practical characteristics of Op-amp.   4
   - (d)   Add $(83)_{10}$ and $(34)_{10}$ in BCD.   4
   - (e)   Convert S-R flip-flop to D flip-flop.   4
   - (f)   Explain parallel i/p, serial o/p shift register.   4

2.
   - (a)   Explain in brief different biasing circuits of BJT.   10
   - (b)   Explain how Op-amp can be used as summing, scaling and averaging   10 amplifier in inverting configuration.

3.
   - (a)   Design and implement one digit BCD adder using IC-7843.   10
   - (b)   Implement the following logic function using 4:1 mux   5
     $f(A, B, C) = \pi M (0, 1, 3, 5, 7)$.
   - (c)   Explain the working of LCD.   5

4
   - (a)   Design a 2-bit comparator using minimum number of gates.   10
   - (b)   Explain the working of Astable multivibrator using IC-555.   10

5.
   - (a)   Design a synchronous counter which goes through following states using   10 J K flip-flop,

     $$0 - 2 - 4 - 6 - 0$$
   - (b)   With the help of neat diagram, explain the functioning of a 4-bit   10 bidirectional shift register.

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20

6. Write short notes on the following :
   (a) VHDL program format
   (b) Universal gates. Implement EX-OR gate using NAND gate
   (c) Integrator using Op-amp
   (d) Current mirror circuit

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DBMS.

QP Code : **30760**

(3 Hours) [Total Marks : 80

N. B. : (1) Question No.1 is **compulsory**.
(2) Solve any **three** questions out of remaining **five** questions.
(3) Assume suitable data if necessary.

1. (a) List all functional dependencies satisfied by the relation   5

X	Y	Z
X1	Y1	Z1
X1	Y2	Z1
X2	Y2	Z1
X2	Y2	Z1

   (b) Explain Generalization and Specialization.   5
   (c) Explain deadlock in brief.   5
   (d) Explain aggregate function with example   5

2. (a) Explain different data models with its advantages and disadvantages.   10
   (b) Draw E-R diagram for Car insurance company that has a set of   10
   customers. Each customer has one or more cars. Each car is zero or
   more accident records.

3. (a) Explain following terms   10
        (i)   Primary key
        (ii) Group by clause
        (iii) Lock point
        (iv) Total participation
        (v)   Data independence
   (b) What is view? How it is created and stored?   10

4. (a) What is JOIN? Explain different types of JOIN along with example.   10
   (b) Consider the following employee database   10
   Employee (emp_name,street,city,date _of_ joining)
   Works (emp name, company _name, salary)
   Company (company_ name, city)
   Manages (emp _ name,manager _name)

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Write SQL queries for following
- (i) Modify the database so that 'Deepa' lives in 'Pune'
- (ii) Give all employees of 'XYZ corporation' a 10% rise in salary
- (iii) List all employees who lives in the same city as heir company city
- (iv) Display all employees who joined in the month of 'March'
- (v) Find all employees who earn more than average salary of all employees of their company.

5. (a) Define Normalization? Explain 1NF, 2NF and 3NF with example   10
   (b) Consider the SQL query given below. Draw initial query tree and   10
   transfom this initial query tree using heuristic query optimization.

   SELECT p.ticketno
   FROM Flight as F, Passager as P, Crew as C
   WHERE F.flightno=c.flightno AND
        F.Date= '06 -23-15' AND
        F.to= 'Mumbai' AND
        P.name=C.name

6. (a) Define transaction? Explain transaction state diagram and properties of   10
   transaction
   (b) Explain Differed database modification and immediate data base   10
   modification and their difference in context of recovery.

QP Code : 30672

(3 Hours)   [80 Marks]

1. Question No. 1 is compulsory.
2. Answer any three out of remaining questions.
3. Assume suitable data if necessary.
4. Figures to the right indicate full marks.

1 (a) Explain with example   3

      (i) Degree of tree

      (ii) Height of tree

      (iii) Depth of tree

(b) What is linked list? Give its applications.   2

(c) What is recursion? State its advantages and disadvantages.   3

(d) Define Asymptotic Notation along with example.   3

(e) What is Expression Tree? Give Example.   3

(f) What are linear and non-linear data structures?   3

(g) What is time Complexity? Determine the Time Complexity for the following code: 3

```
for (c = 0 ; c < ( n - 1 ); c++)
   {
for (d = 0 ; d < n - c - 1; d++)
      {
if (array[d] > array[d+1]) /* For decreasing order use < */
         {
swap        = array[d];
array[d]    = array[d+1];
array[d+1]  = swap;
         }
      }
   }
```

2. (a) Write a program to implement queue using array.   10

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

3. (a) Define binary search tree. Write algorithm to implement insertion and deletion operation.   10

3. (b) Write a program to create single link list and display the list.   10

4. (a) What is priority queue? Give implementation of it.   10

[TURN OVER

4. (b) Using Prim's and Kruskal's algorithm find minimum spanning tree for the following graph: 10
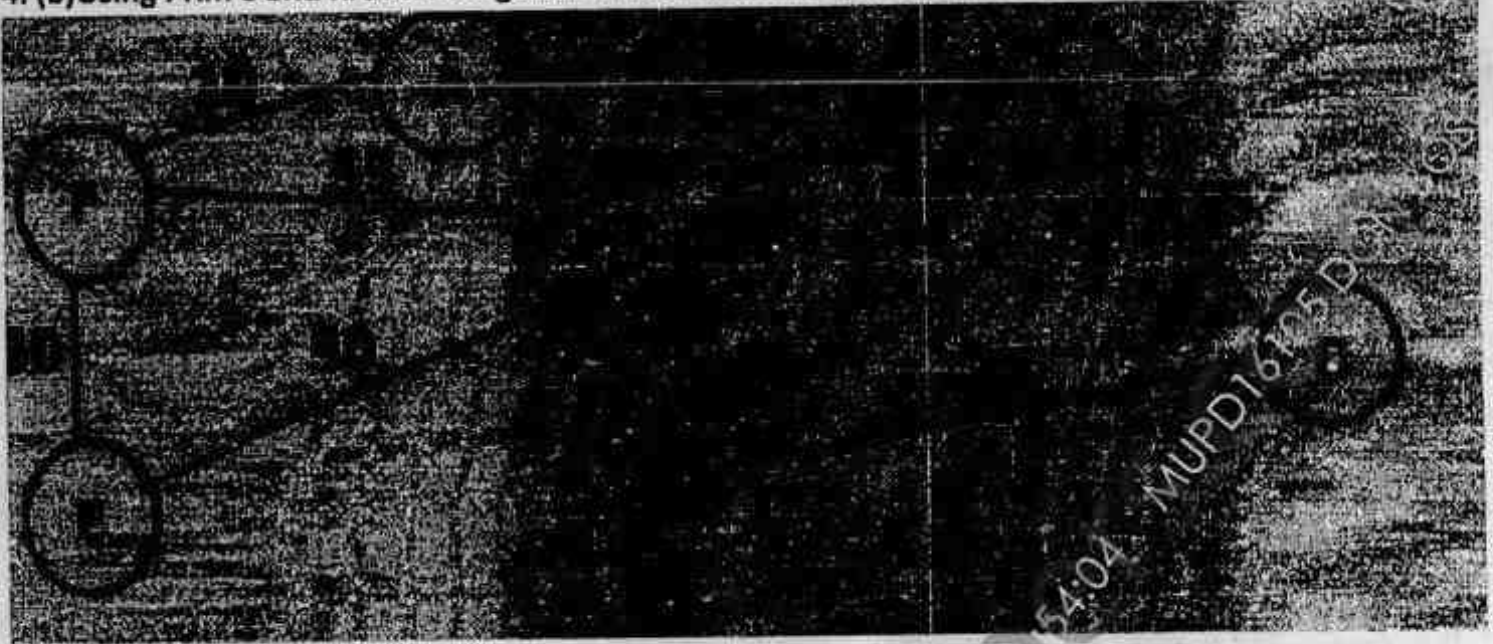
5. (a) What is an AVL tree? Construct the AVL tree for the following set of data.   10

14, 10, 1, 20, 17, 24, 18, 12, 15, 11, 4, 6

5. (b) Construct the binary tree for the inorder and post order traversal sequence given below.   10

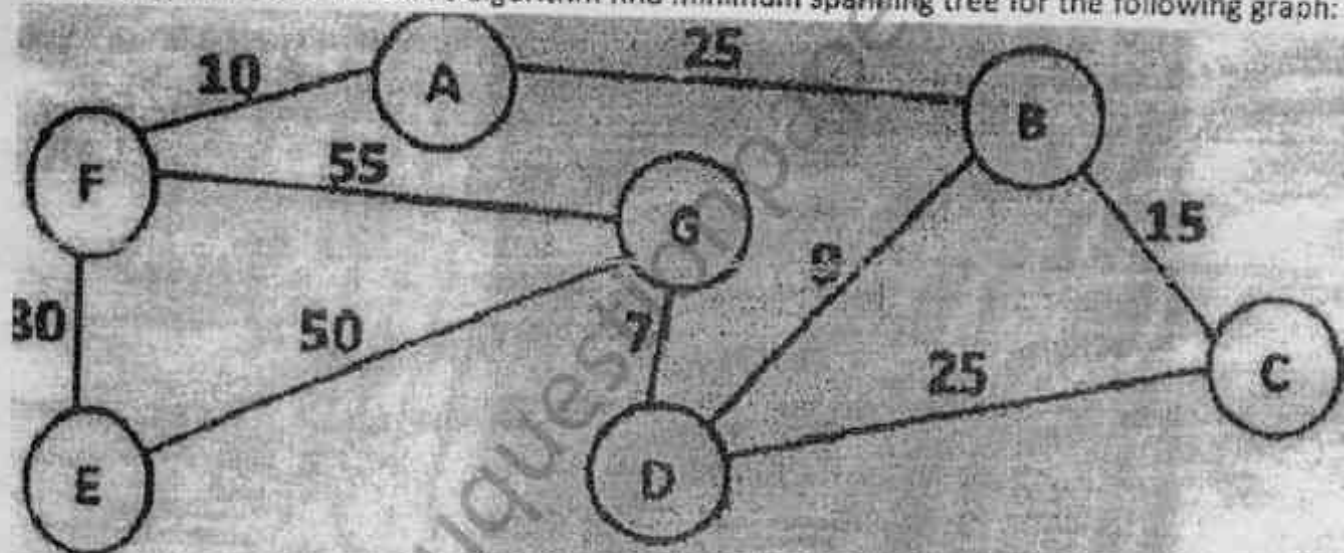| In order:	"INFORMATION"
Post order:	"INOFMAINCTR"

6. Write short note on any four of the following: -   20

i. Euclid's Algorithm

ii. Red and Black Trees

iii. DFS and BFS

iv. B-Tree

v. Radix Sort

Read As :

4. (b)Using Prim's and Kruskal's algorithm find minimum spanning tree for the following graph: 10

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

1) Question No. **1** is compulsory.

2) Attempt any **THREE** of the remaining.

3) **Figures** to the **right** indicate **full** marks.

Q 1.A) If $\int_0^\infty e^{-2t} \sin(t+\alpha) \cos(t-\alpha)dt = \frac{1}{4}$, find α (5)

B) Find half range Fourier cosine series for $f(x) = x$, $0 < x < 2$ (5)

C) If $u(x,y)$ is a harmonic function then prove that $f(z) = u_x - iu_y$ is an analytic

function.   (5)

D) Prove that $\nabla f(r) = f'(r)\frac{\bar{r}}{r}$ (5)

Q.2) A) If $v = e^x \sin y$, prove that v is a harmonic function. Also find the

corresponding analytic function.   (6)

B) Find Z-transform of $f(k) = b^k$, $k \geq 0$ (6)

C) Obtain Fourier series for $f(x) = \frac{3x^2 - 6\pi x + 2\pi^2}{12}$ in $(0, 2\pi)$,

where $f(x+2\pi) = f(x)$. Hence deduce that $\frac{\pi^2}{6} = \frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \dots$ (8)

Q.3) A) Find inverse Laplace of $\frac{(s+3)^2}{(s^2+6s+5)^2}$ using Convolution theorem   (6)

B) Show that the set of functions $\{\sin x, \sin 3x, \sin 5x, \dots\}$ is orthogonal over

$[0, \pi/2]$. Hence construct orthonormal set of functions   (6)

C) Verify Green's theorem for $\int_c \frac{1}{y} dx + \frac{1}{x} dy$ where C is the boundary of

region defined by $x = 1, x = 4, y = 1$ and $y = \sqrt{x}$ (8)

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Q.4) Find $Z\{k^2 a^{k-1} U(k-1)\}$ (6)

B) Show that the map of the real axis of the z- plane is a circle under the

transformation $w = \frac{2}{z+i}$. Find its centre and the radius. (6)

C) Express the function $f(x) = \begin{cases} sinx & |x| < \pi \\ 0 & |x| > \pi \end{cases}$ as Fourier sine Integral. (8)

Q.5) A) Using Gauss Divergence theorem evaluate $\iint_s \bar{N}.\bar{F}ds$

where $\bar{F} = x^2 i + zj + yzk$ and S is the cube bounded by x = 0, x = 1, y = 0,

y = 1, z = 0, z = 1 (6)

B) Find inverse Z-transform of $F(z) = \frac{z}{(z-1)(z-2)}$, $|z| > 2$ (6)

C) Solve $(D^2+3D+2)y = e^{-2t} sint$, with y(0)= 0 and y'(0)= 0 (8)

Q.6) A) Find Fourier expansion of $f(x) = 4 - x^2$ in the interval (0,2) (6)

B) A vector field is given by $\bar{F} = (x^2 + xy^2) i + (y^2 + x^2 y) j$. Show that $\bar{F}$ is

irrotational and find its scalar potential. (6)

C) Find (i) $L^{-1}\{tan^{-1}(\frac{a}{s})\}$

(ii) $L^{-1}\left(\frac{e^{-\pi s}}{s^2-2s+2}\right)$ (8)

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SEM-III (CBSGS) COMP & I.T.
Object Oriented Programming 09/06/16.
Methodology.

QP Code : 30777

Instructions:
(1) Question No 1 is compulsory (3 Hours) TOTAL MARKS : 80
(2) Attempt any three questions out of remaining
(3) Figures to right indicate full marks

Question No.		Max. Marks
Q1(a)	Write a recursive method to calculate factorial of a integer number.	5
Q1(b)	Explain how Java is platform-independent.	5
Q1(c)	Explain bitwise operators available in java with example	5
Q1(d)	Write note on applet lifecycle	5
Q2(a)	Write a detailed note on System.arraycopy()	5
Q2(b)	Write a program to display following pattern:- 1 0 1 1 0 1 0 1 0 1	5
Q2(c)	With suitable example, explain creation and use of user defined packages.	10
Q3(a)	Identify classes and their attributes and draw the relationships that are described by the following rules. Include the multiplicities for each relationship. (i) Companies may employ many people, and people may work for many companies. Every employee in a company has a manager who may manage many subordinate employees. (ii) Library maintains books and magazines. A student can issue a book or return a book. A fine is charged if book is returned after 8 days. The magazines are not issued, but student can read it in library.	10
Q3(b)	Write a program to create vector objects with student names. Program should perform following operations based on choice: i) Add student name ii) Remove student name iii) Display -displays contents of vector using enumeration interface.	10
Q4(a)	Write a program to perform division of two numbers accepted from user. Handle the IOException, NumberFormatException and ArithmeticException using multiple try catch block.	10
Q4(b)	Draw sequence diagram for withdrawing an amount from ATM.	5
Q4(c)	Explain Cohesion and coupling with suitable example.	5
Q5(a)	Write a program to display the area of square and rectangle using the concept of overloaded constructor.	10
Q5(b)	With the help of suitable example explain how threads are created in Java.	5
Q5(c)	Explain multiple inheritance in Java with example.	5

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Turn over

| Q6 | Write short notes on (any four)
(a) Wrapper classes
(b) Static data members and Methods
(c) Abstract class & methods
(d) Parameter passing to an applet
(e) JVM | 20 |

QP Code : 30625

(3 Hours) [Total Marks : 80

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

(2) Out of remaining attempt any **three**.

(3) Assume & mention suitable data wherever required.

(4) Figures to **right** indicates **full** marks.

1. Solve **any four** :- 20

(a) State the advantages of digital communication over analog communication. Justify each point.

(b) Define the following terms.

    (i) Noise figure   (ii) Noise temperature

    (iii) Noise bandwidth   (iv) Noise voltage   (v) Modulation.

(c) Compare pulse code modulation and delta modulation.

(d) Explain in short pre-emphasis and De-emphasis.

(e) What is BPSK signal. Draw the BPSK signal for the following binary signal 10111010.

2. (a) Define signal to noise ratio. Explain the effect of cascade connection on a 10 signal to noise ratio. An amplifier with 10dB noise figure and 4 dB power gain is cascaded with a second amplifier which has a 10dB power gain. What is overall noise figure and power gain.

(b) State and prove the following properties of Fourier transform with example 10

    (i) Time shifting.   (ii) Convolution in time domain

3. (a) An amplitude modulated waveform has a form $x(t) = [10 (1 + 0.6 \cos 2000 \pi$: 10 $t + 0.4 \cos 4000 \pi t) \cos 20000 \pi t)]$

    (i) Sketch the amplitude spectrum of X(t).

    (ii) Find the power spectral of each spectral component including carrier

    (iii) Find the total power and sideband power

    (iv) What is the modulation index

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(b) What are the limitations of TRF receiver. Explain how these limitations are avoided using superheterodyne receiver.   10

4. (a) With the help of neat circuit diagram and phasor diagram explain the working of Foster Seelay discriminator.   10

(b) What is multiplexing in communication system. Draw and explain in brief the transmitter and receiver of FDM.   10

5. (a) State and prove sampling theorem for low pass band limited signal.   10

(b) Draw the block diagram of PWM generator. Explain the working giving waveforms at the output of each block.   10

6. (a) Explain slope overload error and hunting error in Delta modulation. Derive the condition to avoid slope overload distortion.   10

(b) Explain the generation and detection of FSK signal.   10