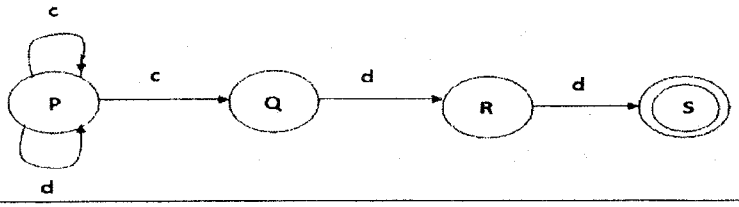
Con. 4873–10. **CM–3696**

(3 Hours) **[Total Marks : 75**

N.B. (1) Attempt any **three** questions from each **section.**
(2) Answer to the two sections must be written in separate **answer books.**
(3) Figures to the right indicate full marks.
(4) Use of simple calculator and statistical tables are allowed.

Q1		
(a)	Describe in brief the various phases of a complier.	07
(b)	Define Non-Deterministic Automaton and Deterministic Automaton; Convert the given Non-deterministic Automaton into a Deterministic Automaton.  	06
Q2		
(a)	Define regular expression. Draw transition diagram for the following regular expression: ab*cbb	04
(b)	What is Left Recursion? How do remove it?	03
(c)	Which of the following sentences can be derived from the given grammer starting with Nontermninal S? In each case, give left most derivation and rightmost derivation a) aacb b)abcaababcd c) aacbbcc	06
Q3		
(a)	Enlist and Explain various Data Elements used in programming language.	05
(b)	What are Recursive – Descent parser? Explain its implementation.	07
Q4		
(a)	Consider the Simple Precedence Relation matrix below. Generate the precedence functions for the above matrix	06
(b)	Consider following grammar S->iSeS | iS | a Construct the LR (0) item set for the above grammar.	06

	+	*	(	)	id	$
+	>	<	<	>	<	>
*	>	>	<	>	<	>
(	<	<	<	=	<	
)	>	>		>		>
id	>	>		>		>
$	<	<	<		<	

[TURN OVER

Q5		
(a)	Construct the parsing table and the productions for the LR parser moves given below 0 0 (4 0 (4 a 5 0 (4 F 3 0 (4 T 2 0 (4 T 2 * 7 0 (4 T 2 * 7 a 5 0 (4 T 2 *7 F 10 0 (4 T 2 0 (4 E 8 0 (4 E 8)11 0 E 1 What is the input string parsed by the parser?	06
(b)	Consider the following grammar E-> E+E E->E*E E->(E) E->id Show steps of Shift –Reduce parser for input id + id * id.	06

Section II

6 a. Convert the following infix expression to postfix expression. 3

if a then if b then if c-d then a+c else a*c else a+b else a*b using ? as a ternary postfix operator.

b. Consider the following productions used in a Grammar for desk top calculator. 5

S->E$
E->E+E
E->E*E
E->(E)
E->I
I->I digit
I->digit
Write the semantic actions for above productions. Give the parse tree and translation for the expression 35*12

c. What are characteristics of good intermediate code? 5
Write triples for the following expression
(1) A[I] := B*C+C
(2) A := B[I] + C

7 a How information in symbol table can be retrieved fast? 2

b Prepare addressing function to access P(A,B,C) element of three dimensional array. 5

c. Suppose we have a hash table with 10 locations and we wish to enter "names" which are integers, using the hash function h(i) = i mod 10. Show the links created in the hash and storage tables if the first ten primes links created in the hash and storage tables if the first ten primes 2,3,5,...,29 are entered in that order. As you hash more primes into the table, do you expect them to distribute randomly among the ten lists? Why or why not? 5

8 a. Draw parse tree for 2

Q > P and T > U or P > T

b. Explain implementation of a simple Stack-Allocation scheme. 5

c. Consider the following matrix addition routine: 5

```
begin
    for i:= 1 to n do
        for j:= 1 to n do
            C[i,j] := A[i,j] + B[i,j];
end
```

Assuming A,B, C are allocated static storage and there are two bytes per word in a byte-

addressed memory, produce three-address code for the matrix addition program.

Partition the program into basic blocks.

9 a. What is Deadcode elimination? 2

b. How global data flow analysis can be used in code optimization? 5

c. For the flow graph of your choice compute: 5

1. ud- and du-chains.
2. Live variables at the end of each block.
3. Available expressions
4. Very busy expressions

10 a. What is cost of assembly instruction? How it is useful in code generation? 3

b. What is a loop? Explain the methods used for detecting loops in the flow graph. 5

c. Assume a target machine is a byte-addressable machine with 216 bytes of memory and have eight general purpose registers R0, R1, R2, ..., R7; each capable of holding 16-bit quantity. Generate code for expression w := (B-A) + (B-C) + B. Assume suitable instructions for the target machine. Explain assumed instructions. 5

Con. 4882–10. **CM–3732**

(3 Hours) **[Total Marks : 75**

N. B.: (1) Attempt any **three** questions from **each section.**

(2) Answers to the two sections must be written in **separate answer sheet.**

(3) Figures to the right indicate full marks.

(4) Assume additional data if necessary but state the same clearly.

(5) Symbols have their usual meanings and tables have their usual standard design unless stated otherwise.

(6) Use of simple calculator and statistical tables are allowed.

Section I

1	a.	Compare Z-transform, DTFT and DFT.	3
	b.	For each impulse response listed below, determine the corresponding system is (i) causal (ii) stable 1. $h(n) = \sin(n\pi/2)$ 2. $h(n) = 2^n u(-n)$	5
	c.	Let x(n)={1,2,-1,2,3,-2,-3,-1,1,1,2,-1} and h(n)={2, 2} Compute x(n)*h(n) using overlap-add method. Explain each step in detail.	5
2	a	Define auto correlation and cross correlation of two sequences x(n) and y(n).	2
	b	Compute DFT of a sequence x(n) = {1, -1, 1, -1} using DIT FFT algorithm. Draw flow-graph diagram.	5
	c.	What is digital filter realization? With a neat diagram explain the Direct Form I realization of a digital filter. Give example.	5
3	a.	State the computational complexity for direct form-II realization of IIR system.	2
	b.	Determine direct form-II realization for following LTI system y(n) = x(n) - x(n-1) +2x(n-2) – 3x(n-4)	5
	c.	Explain mapping of S-plane to Z-plane in the design of IIR filters.	5
4	a.	Define all zero system and all pole system which are used in direct form-I realization of IIR system.	2
	b.	Explain how a sequence is produced from an analog waveform by a analog to digital converter (ADC).	5
	c.	What is a filter? What is its system transfer function? Differentiate between FIR and IIR filters.	5
5	a.	State characteristics of Chebyshev filters.	3
	b.	What is a block floating point representation of numbers? What are advantages of such a system?	5
	c.	What is the purpose of Bluestein's algorithm? How it is achieved? State the major significance of Bluestein algorithm.	5

SECTION II

6.	(a)	Given an LTI system with impulse response $h(n_1, n_2) = a^{n1, n2}$ $-\infty \leq n_1, n_2 \leq \infty$ and input to this system of the form $x(n_1, n_2) = 1$ $0 \leq n_1, n_2 \leq 2$ and 0 otherwise. Determine $y(n_1, n_2)$. the output of the system.	3.
	(b)	Define and explain (i) Causality (ii) Separability and (iii) Stability	5.
	(c)	Explain two-dimensional Z transform and its convolution property.	5.
7.	(a)	Explain Direct Form FIR hardware. Illustrate with a neat block diagram the implementation of Direct Form FIR filter.	6.
	(b)	Explain with a block diagram the hierarchy of hardware leading to signal processing algorithms.	5.
	(c)	Define Fan-Out and how does it affect the performance of a logic gate?	2.
8.	(a)	Differentiate between Unipolar and Bipolar devices. Explain Unipolar devices with appropriate sketch of it.	6.
	(b)	Explain TDM to FDM translator with a neat block diagram.	6.
9.	(a)	What are in-place and not-in-place FFT algorithms?	2.
	(b)	Explain structure of the LSP2 and differentiate between FDP and LSP2	6.
	(c)	Define cache memory. Explain the steps needed to perform floating addition.	4.
10.	(a)	Explain the concept of Voiced and Unvoiced sounds.	2.
	(b)	Write a note on Digital model of speech production.	4.
	(c)	State the various applications of RADARS. Illustrate the experimental setup for Airborne surveillance RADAR signal processing.	6.

Con. 4912–10. CM–3837

(3 Hours) [Total Marks : 75

N.B. (1) Attempt any three questions from each section
(2) Answer to the two sections must be written in separate answer books.
(3) Figures to the right indicates full marks.
(4) Use of simple calculator is allowed.
(5) Abbreviations have their usual meanings unless stated otherwise.

Section I

1. (a) Minimum shift keying method is used in most of the wireless systems. Explain with the help of diagram how to avoid phase shift in the resulting MSK signal. [2]
(b) Describe Demand assigned multiple access scheme along with the diagram. [5]
(c) Explain the scenario of mobile terminated call and mobile originated call with the help of diagram. [5]

2. (a) What are the reasons for the delays in a GSM system for packet data traffic? Distinguish between circuit switched and packet oriented transmission. [3]
(b) What are the different components of DECT system architecture reference model. Draw the diagram for the same. [5]
(c) Name basic applications for satellite communication and elaborate different handover scenarios in satellite systems. [5]

3. (a) Write short note on: (i) DAB (ii) DVB [3]
(b) What are infrastructure and adhoc networks. Explain them with architectural diagram of IEEE 802.11. [5]
(c) What are different inter frame spacing in medium access control layer. Elaborate scenario of basic DFWMAC-DCF with several competing senders drawing the diagram. [5]

4. (a) Explain tunneling and encapsulation phenomenon in mobile network layer. [6]
(b) Write note on reverse tunneling and dynamic host configuration protocol. [6]

5. (a) Name reasons for the development of wireless ATM. What is one of the main differences to internet technologies from this point of view? Why did WATM not succeeded as stand alone technology, what parts of WATM succeeded.? [6]

(b) Define any two: [6]

i) Wireless Application Protocol
ii) Snooping TCP
iii) Wireless session protocol
iv) Indirect TCP
v) Wireless datagram protocol
vi) Mobile –TCP
vii) Wireless markup language
viii) Classical and slotted Aloha

SECTION II

6.a) What is the model of a system? Explain different types of models in simulation. (05)

b) A company manufactures 200 motor cycles per day. Depending upon availability of raw materials and other conditions, the daily production has been varying from 196 motor cycles to 204 motor cycles, whose probability distribution is as given below;

Production per day	196	197	198	199	200	201	202	203	204
Probability	0.05	0.09	0.12	0.14	0.20	0.15	0.11	0.08	0.06

The motor cycles are transported in a specially designed three-storeyed lorry that can accommodate only 200 motor cycles. Using the following random numbers: 82, 89, 78, 24, 52, 53, 61, 18, 04, 23, 50, 77, 27, 54, 10. Simulate the process to find out;

i) the average number of motor cycles waiting in the factory?
ii) The average number of empty spaces on the lorry? (08)

7.a) Write probability density function (f(x)), Cumulative Distribution function (F(x)), expectation and variance of Uniform distribution over the interval (a, b) (04)

b) In a computer laboratory, the facility of only one printer is available for a group of four students. Each student has the same probability 0.30 of requiring the printer facility. Assume that all the four students work independently. Find the probability that the printer is not used by any one of them and probability that printer is used by only one of them. (04)

c) A cola-dispensing machine is set to dispense on average on average 7.00 ounces of cola per cup. The standard deviation is 0.10 ounces. The distribution amounts dispensed follows a normal distribution. (Given area under standard normal curve; from $z = -\infty$ to 2.5 is 0.9938 and from $z = -\infty$ to 1 is 0.8413.)

i) What is the probability that the machine will dispense between 7.10 and 7.25 ounces of cola?
ii) What is the probability that the machine will dispense 7.25 ounces of cola or more? (04)

8.a) Explain the terms with reference to the queueing systems; service times and service mechanism. (04)

b) A barber shop has two barbers. Assume that the customers arrive in a Poisson fashion at the rate of 5 per hour. Each barber serves customers according to an exponential distribution with mean of 15 minutes.
i) What is the probability that a customer will not have to wait for hair cut?
ii) What is the expected number of customers in the queue? (04)

c) The time intervals between dial up connections to an Internet service provider are exponentially distributed with a mean of 15 seconds. Find the probability that the third dial up connection occurs after 30 seconds have elapsed. (04)

9.a) Obtain the generator and write an algorithm to generate random sample of size n from exponential distribution using inverse transform technique. (05)

b) Test whether the 3rd, 8th, 13th and so on, numbers in the following sequence are autocorrelated. Use $\alpha = 0.05$ and table value= 1.96. Observations: 0.12, 0.01, 0.23, 0.28, 0.89, 0.31, 0.64, 0.28, 0.83, 0.93, 0.99, 0.15, 0.33, 0.35, 0.91, 0.41, 0.60, 0.27, 0.75, 0.88, 0.68, 0.49, 0.05, 0.43, 0.95, 0.58, 0.19, 0.36, 0.69, 0.87. (08)

10.a) Write an algorithm to generate a sequence of 2-digit random numbers using Linear Congruential method. Also generate three random numbers between 0 and 1 with $X_0 = 37$, $a = 7$, $c = 29$ and $m = 100$. (05)

b) Discuss three steps in model building. (04)

c) Write an algorithm to generate stationary AR(1) time series model. (03)

Con. 4898–10. CM–3879

(3 Hours) [Total Marks : 75

N.B. (1) Attempt any **three** questions from each **section.**
(2) Answer to the two sections must be written in separate **answer books.**
(3) **Figures** to the right indicate full marks.
(4) Use of simple calculator and statistical tables are allowed.

SECTION I

1. (a) Define data marts. What are its advantages? How they are different from data warehouse? 5.

(b) What are the different features of managing a project to build a data ware house? Explain. 5.

(c) Define an architecture plan of a data warehouse. What are the different objectives of this plan? 3.

2. (a) Define a snow flake schema. How is it different from a star schema? Consider the following face table 5.

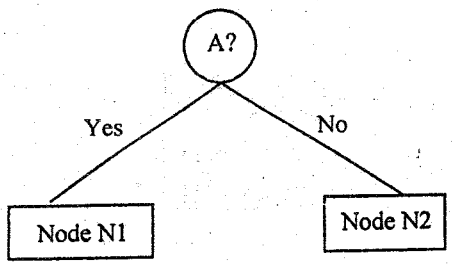
Sales (Market_Id, Product_Id, Time_Id, Sales_Amt)

Draw a cube containing entities with dimensions of your choice and locate dimension tables. Depict the relation between the fact and dimension tables using star schema and snow flake schemas.

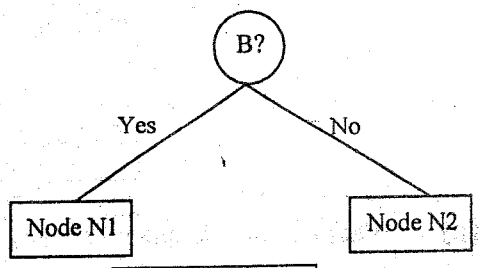
(b) What are the different data integration problems faced by user while loading data into data warehouse? 5.

(c) What are the different stages of information potentials of data warehouse in information access and delivery? 3.

3 (a) Define Gini index to measure impurity measures in binary classification problem. Suppose there are two ways to split the data into subsets as shown below. Before the split there are 8 counts in each class. 5.



	N1	N2
C1	6	2
C2	4	4



	N1	N2
C1	1	7
C2	6	2

Decide which binary classifier A or B will be preferred using Gini index.

(b) Explain how to construct a classification model for a given training set and verifying using test set for a suitable database by considering a classifier rule of your choice. 5.

(c) Write a short note on box plot analysis. 2.

4. (a) How to determine similarity between binary variables using Jacord's coefficient? From the following information, find the pair of names that is most similar. 5.

Name	Fever	Cough	Test-1	Test-2	Test-3	Test-4
Seema	1	0	0	1	0	0
Heena	1	0	0	1	0	1
Deena	1	1	0	0	0	0

(b) Ten observations on two variables are available, as shown in the following table: **5.**

Observations	x_1	x_2
A	3	7
B	4	5
C	4	9
D	5	8
E	7	3
F	7	5
G	8	4
H	8	5
I	9	6
J	8	7

(i) Plot the observations in a scatter diagram. How many groups would you say there are and what are their members?

(ii) Apply k-medoid method, assuming that the observations belong to two groups that one of these groups consists of B and H.

(c) What are the different steps in Knowledge Discovery in Databases (KDD)? **2.**

5. (a) Explain the concept market basket analysis. Support your answer by giving two examples. **5.**

(b) What do you mean by frequent item set? Use Apriori algorithm to generate frequent item sets for the following by taking support threshold as 60%: **5.**

TID	Items
1	{Bread, Milk}
2	{Bread, Diapers, Beer, Eggs}
3	{Milk, Diapers, Beer, Cola}
4	{ Bread, Milk, Diapers, Beer}
5	{ Bread, Milk, Diapers, Cola}

(c) What are the advantages of neural networks **2.**

SECTION II

6. (a) Define parallel and distributed DBMS. What are the similarities and differences between them? **5.**

(b) In Collaborating server architecture, when a transaction is submitted to the DBMS briefly describe how its activities at various sites are coordinated. In particular, describe the role of transaction managers at the different sites, the concept of sub transactions and the concept of distributed transaction atomicity. **5.**

(c) Discuss with example how each of the following operators can be parallelized using data partitioning: scanning, sorting, join. **2.**

7. (a) Define the term distribute data independence. What does this mean with respect to querying and updating data in the presence of data fragmentation and replication? 5.

(b) Describe three-phase commit protocol in distributed database. Suppose that two-phase commit protocol is used. Explain how the system recovers from failure and deals with a particular transaction T in each of the following cases: 5.

(i) A subordinate site for T fails after receiving a prepare message and force-writing an abort log record but before responding to the prepare message.

(ii) A subordinate site for T fails before sending prepare message.

(c) Explain the role of local and global histories in distributed systems. 2.

8. (a) What is the difference between persistent and transient objects? How persistence is handled in typical OO database systems? 5.

(b) When do you say that two objects are in identical state (deep equality) and equal state (shallow equality)? Consider the following objects and find which are having identical state and equal state. 5.

$o_1=(i_1, \text{tuple}, < a_1: i_4, a_2: i_6 >)$ $o_2=(i_2, \text{tuple}, < a_1: i_5, a_2: i_6 >)$

$o_3=(i_3, \text{tuple}, < a_1: i_4, a_2: i_6 >)$ $o_4=(i_4, \text{atom}, 10)$

$o_5=(i_5, \text{atom}, 10)$ $o_6=(i_6, \text{atom}, 20)$

(c) Why key extends is important in OO database? 2.

9. (a) Define XML schema. What is the difference between XML schema and XML DTD? 5.

(b) Create a data containing document using XML for the following relational schema by taking a single tuple of your choice. 5.

Shop(sNo, street, city, pinCode)
Toys(tNo, custNo, tName, tPrice)
Customer(custNo, sNo, street, city)

(c) Briefly discuss the consistency and termination problems when designing a set of active rules. 3.

10. (a) What is spatial database? Explain how to model spatial data in traditional DBMS. Illustrate an example to support your answer. 5.

(b) Is *time* an important attribute in temporal database? Differentiate between *valid* and *transaction* time by giving suitable relations. 5.

(c) What do you mean by mobile transactions in mobile database? How it is different from transactions in distributed DBMS? 3.
