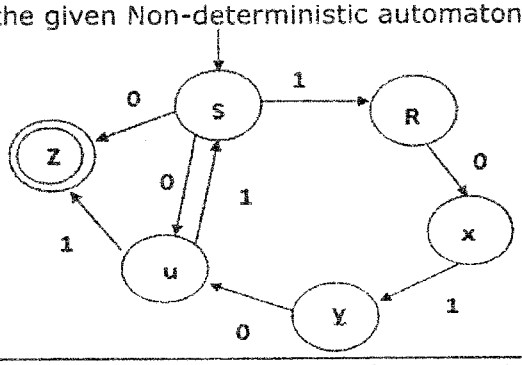
M.SC. **PART – I** (APRIL – 2010) : **PAPER – I**

Con. 1639–10. **FR–6196**

(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

Q1		
(a)	Write a note on input buffering.	**05**
(b)	Define regular expressions? Draw the transition diagram for the regular expression (0 * +1) .(0 1*)	**05**
(c)	Briefly explain Regular grammars.	**03**
Q2		
(a)	Define Non-Deterministic Automaton and Deterministic Automaton, convert the given Non-deterministic automaton into a Deterministic automaton 	**07**
(b)	Comment in detail on top-down parsing and difficulties in such parsing. How are they solved?	**06**
Q3		
(a)	Differentiate between Static Storage allocation and Dynamic storage allocation.	**04**
(b)	Consider the grammar with the.productions A → A + A | A – A | a Is this an ambiguous grammar? Justify	**05**
(c)	Comment on attribute binding	**03**
Q4		
(a)	Consider the following grammar (1) E → E * B (2) E → E + B (3) E → B (4) B → 0 (5) B → 1 Using the below parsing table Parse the string 1+1 *1.	**07**

state	action					goto	
	*	+	0	1	$	E	B
0			s1	s2		3	4
1	r4	r4	r4	r4	r4		
2	r5	r5	r5	r5	r5		
3	s5	s6			acc		
4	r3	r3	r3	r3	r3		
5			s1	s2			7
6			s1	s2			8
7	r1	r1	r1	r1	r1		
8	r2	r2	r2	r2	r2		

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(b)	1. S → x 2. S → y 3. S → z 4. S → S + S 5. S → S - S 6. S → S * S 7. S → S / S 8. S → (S) Using the above Grammar generate the derivation for the string (x + y) * x - z * y / (x + x)	**05**
Q5		
(a)	Consider the following Grammar E->TE′ E′ -> +E | λ T-> FT′ T′->T | λ F-> PF′ F′-> *F′ | λ P -> (E) | a | b | λ i) Compute FIRST and FOLLOW for each non-terminal ii) Construct the predictive parsing table for the grammer.	**06**
(b)	Consider the grammar G and the parsing table for G A → A (A) A → ε Show the moves made by LR parser on input ()()	**06**

State	Action			Goto
	(	)	$	A
0	r2	r2	r2	1
1	s2		acc	
2	r2	r2	r2	3
3	s2	s4		
4	r1	r1	r1	

Section II

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

(a+b*c)+c*a

Evaluate the postfix expression for a=2, b=3 and c= 1

b. Consider the expression P > Q or R > S and T > U 5

Write the quadruples for the above expression and draw a parse tree for the same.

c. Explain syntax directed translation of Case statements. Use your translation scheme to translate following case statement: 5

```
switch A+B
begin
    case 2: X := Y
    case 5:
        switch X
            begin
                case 0: A := B+1
                case 1: A := B+3
                default: A := 2
            end
    case 9: X := Y-1
    default: X := Y+1
end
```

7 a Construct the DAG for the following basic block. 2

```
D := B*C
E := A+B
B := B*C
A := E-D
```

b Consider the following matrix multiplication routine: 5

```
begin
    for i:= 1 to n do
        for j:= 1 to n do
            C[i,j] := 0;
    for i:= 1 to n do
        for j:= 1 to n do
            for k=1 to n do
                C[i,j] := 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 multiplication program.

Partition the program into basic blocks.

c. Consider the following intermediate code: 5

```
T1=-C
T2=B*T1
T3=-C
T4=B*T3
T5=T2+T4
A=5
```

Draw a DAG of the above code sequence and hence write the arithmetic equation formed.

8 a. How errors can be recovered? 2

b. Give the simplest form of declaration syntax found in programming languages. Write suitable grammar for declaration. Give the syntax-directed translation scheme for declaration statements. 5

c. Give importance of code optimization phase. State different methods of code optimization and discuss any two. 5

9 a. Define live variables. 2

b. Consider the assignment statement 5

$X := A*B + C*D - E*F$

Give three-address code with stacked temporaries.

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. Explain the environment of the code generator. 3

b. 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 := (A-B)-(A-C)+A. Assume suitable instructions for the target machine. Explain assumed instructions. 5

c. What is addressing mode? Normally what addressing modes are used in assembly language of general purpose microprocessor? 5

M.SC. **PART – I** (APRIL – 2010) : **PAPER – II**

Con. 1881–10.

FR–6219

(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 meaning and tables have their usual standard design unless stated otherwise.
(6) **Use** of simple calculator and statistical tables are **allowed**.

Section I

1. (a) Define linear and circular convolution of two sequences. What are uses of circular convolution ? **3**
   (b) What is twiddle factor ? Find the IDFT of sequence with DFT [8, –2, 0, –2]. **5**
   (c) Define a rectangular window and derive the frequency response of the rectangular window. **5**

2. (a) What are applications of FFT algorithm ? **2**
   (b) For each impulse response listed below, determine the corresponding system is (i) causal (ii) stable : **5**
   (1) $h(n) = \delta(n) + \sin(\pi n)$ (2) $h(n) = e^{2n}\, u(n-1)$.
   (c) What is pole-zero plot ? Why it is necessary ? Draw pole-zero diagram for a system having transfer function $H(z) = 1 + z^{-4}$. **5**

3. (a) State difference between overlap-save method and overlap-add method. **2**
   (b) Explain Remez Exchange algorithm used in the design of optimal FIR filters. **5**
   (c) What are maximal ripple filter ? How do you obtain maximal ripple filters ? **5**

4. (a) What is a Gibb's phenomenon ? **2**
   (b) Using block diagram explain analog to digital conversion process. **5**
   (c) Differentiate between fixed-point arithmetic and floating-point arithmetic. Find 2's compliment of 0·0101. **5**

5. (a) Explain the terms :– **3**
   (i) Bit shuffling
   (ii) Bit reversal in the context of FFT algorithms.
   (b) What is purpose of Chirp Z-transform algorithm ? Explain algorithm in detail. **5**
   (c) Explain in detail the bilinear transformation technique used for digitizing an analog filter. **5**

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Section II

6. (a) Define and sketch the following two dimensional sequences : 3
   (i) Digital step
   (ii) Exponential.
   Also state the applications where two dimensional signal processing is required.
   (b) When is the filter said to be separable for two dimensional systems ? Illustrate the advantage of separable filters. 5
   (c) The input to a two dimensional linear time-invariant filter is the sequence $x(n_1, n_2) = L^{n1}\, u_0(n_1 - n_2)$ $0 \leq n_1, n_2 \leq \infty$. The impulse response of the filter is of the form $h(n_1, n_2) = k^{n1}\, u_0(n_1 - n_2)$ $0 \leq n_1, n_2 \leq \infty$. 5
   Find the output $y(n_1, n_2)$ of this filter.

7. (a) Explain the steps needed to perform floating addition with a suitable example. 5
   (b) Explain structure program and states for FIR implementation using two parallel arithmetic elements. 6
   (c) Define Unipolar. 2

8. (a) Explain the working of TTL with a circuit diagram and differentiate between TTL and ECL circuits. 6
   (b) Explain FFT computation using Fast scratch memory. 3
   (c) Compare Radix1 and Radix4 Pipeline FFTs. 3

9. (a) Explain hardware realization of a digital frequency synthesizer. 4
   (b) Explain the concept of cache memory and state the various ways by which it may be incorporated into a computer. 4
   (c) Write a note on FDP structure. 4

10. (a) Explain the block diagram of a modern RADAR system. 6
    (b) Explain the concept of Voiced and Unvoiced sounds. 2
    (c) Write a short note on homomorphic processing of speech. 4

Con. 1698-10. **FR-6250**

(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 books.
(3) **Figures** to the **right** indicate **full** marks.
(4) Use of **simple calculator** is **allowed.**
(5) **Abbreviations** have their usual meanings unless stated **otherwise.**

Section I

1. (a) Explain whether directional antennas would be useful in mobile phones. How can the gain of the antenna be improved ? **3**
   (b) Describe packet reservation multiple access scheme along with the diagram. **5**
   (c) Explain the different types of hand over in GSM system with the help of a diagram. **5**

2. (a) How is localization, location update and roaming are done is GSM and reflected in the databases ? What are typical roaming scenarios ? **3**
   (b) What are the different components of GPRS architecture reference model ? Draw the diagram for the same. **5**
   (c) What characteristics do the different satellite orbits have ? What are their pros and cons ? **5**

3. (a) What are infra red and radio transmission ? Write their advantages and disadvantages. **2**
   (b) Explain broadcast transmission and different broadcast patterns with the help of diagram. **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) Write note on IPv6 and dynamic host configuration protocol. **6**
   (b) Explain Mobile ad-hoc networks with reference to routing. **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) Hidden and exposed terminals.

Section II

6. (a) Explain what do you mean by simulation ? State advantages of simulation. **4**
   (b) A firm has a single channel service station with the following arrivals and service time probability distributions ; **9**

Inter-arrival time (minutes)	Probability	Service Time	Probability
10	0.10	5	0.08
15	0.25	10	0.14
20	0.30	15	0.18
25	0.25	20	0.24
30	0.10	25	0.22
		30	0.14

The customers arrival at the station is a random phenomenon and the time between the arrivals varies from 10 minutes to 30 minutes. The service time varies from 5 minutes to 30 minutes. The queuing process begins at 10 A.M. An arrival goes to the service facility immediately, if it is free. Otherwise it will wait in a queue. The queue discipline is first-come first-served. If the attendant's wages are Rs. 1 per minute and the customer's waiting time costs Rs. 1.5 per minute. Obtain average waiting time cost of customer and average attendant's wage using simulation for next ten arrivals. Use random numbers :—

for arrival : 0.64, 0.28, 0.83, 0.93, 0.99, 0.15, 0.33, 0.35,0.91,0.41

for service : 0.35, 0.59, 0.01, 0.87, 0.59,0.80, 0.09, 0.30, 0.47,0.27

7. (a) Suppose a random variable X has following probability density function, 4

$P(x) = 1/3 ; x = 0$
$= 2/3 ; x = 1$
$= 0 ;$ elsewhere

Obtain (i) Cumulative Distribution Function (cdf) ;
(ii) Expectation of X (E(X)) and
(iii) P(X = 2)

(b) The average number of students visiting health unit in a University on any one day follows a Poisson distribution equal to four students per day. What is the probability that the number of students visiting the health unit on a particular day is (i) equal to five and (ii) less than one ? 4

(c) Life time of the video adapter card for a PC, in months denoted by the random variable X is exponentially distributed with mean 4. What is the probability that the card will last for at least 2 years and what is the probability that the card will last for more 2 years given that it was alive at one hour ? 4

8. (a) Explain the following terms with reference to queuing systems ; 4
Queue behavior and Queue discipline.

(b) A barber shop is run by a single barber and the shop has total six chairs available to accommodate waiting customers. When all chairs are full a person has to go elsewhere without entering the shop. Customers arrive with a Poisson process at an average rate of three per hour and spend fifteen minutes in the barber's chair for hair cut. 4
(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 ?

(c) The mean starting salary for college graduates in the spring of 2005 was \$36,280. Assume that the distribution of starting salaries follows the normal distribution with standard deviation of \$3,300. What is the probability that graduates have starting salaries (i) between \$35,000 and \$40,000 (ii) more than \$45,000. Given area under standard normal curve ; from $z = -\infty$ to 1.13 is 0.870762 ; from $z = -\infty$ to – 0.39 is 0.3483 and from $z = -\infty$ to 2.64 is 0.9959. 4

9. (a) Write an algorithm to generate random numbers between 0 to 1 using Combined Linear Congruential generator. For the algorithm use two generators (k = 2) with parameters $m_1 = 2147483563$, $a_1 = 40014$, $m_2 = 2147483399$, $a_2 = 40692$. Select seed between 1 to m_i for i^{th} generator i = 1,2. 4

(b) Discuss the run test based on runs up and down to test independence of generated numbers. 8

10. (a) Obtain a generator to generate random sample for the following distribution ; 5

$F(x) = 0 ; x \leq 0$
$= x^2/2 ; 0 < x \leq 1$
$= 1 - (2 - x)^2/2 ; 1 < x \leq 2$
$= 1 ; x > 2$

Also generate a random sample of size n = 3 using your generator. To generate random sample use random numbers; 0.276, 0.183, 0.080.

(b) Explain the following terms with reference to simulation ; verification and validation. 4

(c) Explain what is EAR(1) model. Write an algorithm to generate EAR(1) time series model. 4

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M.SC. **PART – I** (APRIL – 2010) : **PAPER – IV**

Con. 1703–10. **FR–6280**

(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)** Explain why there is a need to separate operational and informational systems. Give an example of each of the system. **5.**

(b) What do you mean by information package? Give an example by taking a theme as Hotel. **5.**

(c) Explain the architecture of a data warehouse. Explain the architecture in its three major areas. **3.**

2. **(a)** Write a short note on dimensional modeling in data design of a data warehouse. **5.**

(b) Write a short note on data scrubbing. **5.**

(c) What are different methods to deliver the information to the user from a data warehouse? **3.**

3 **(a)** What are different data cleaning tasks in data preprocessing? What majors are to be taken for redundant of data in data preprocessing? **5.**

(b) Define entropy in information theory. Consider the following information about customers whose age is given and accordingly decision is taken regarding the purchase of a laptop. Compute entropy and gain for age. **5.**

Age	Buys laptop = yes	Buys laptop = no	Total
≤ 40	2	3	5
41 to 50	4	0	4
> 50	3	2	5
Total	9	5	14

(c) Illustrate with examples the difference between database queries and data mining queries. **2.**

4. **(a)** What is cluster Analysis? What do you mean by outliers in cluster analysis? Clusters are formed using un-supervised learning methods. Is it true? Justify your answer. **5.**

(b) The daily expenditures on food (X_1) and clothing (X_2) of five persons are shown in table below: **5.**

Person	X_1	X_2
A	2	4
B	8	2
C	9	1
D	1	5
E	8.5	1

Use AGNES single linkage method to cluster the above data and compare the dendrogram.

(c) Define a fine state machine. What is a Markov property? **2.**

5. (a) Define support and confidence to measure the strength of association rule. Calculate support and confidence for the association rule {Milk, Diapers} → {Beer} from the following: 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}

(b) Develop frequent pattern (FP) tree for the following database with minimum support as 1. 5.

TID	Items
1	{A,B}
2	{B, C, D}
3	{A, C, D ,E}
4	{ A, D, E}
5	{ A, B, C}
6	{A, B, C, D}
7	{B, C}
8	{A, B, C}
9	{A, B, D}
10	{B, C, E}

(c) Write a short note on web content mining. 2.

SECTION II

6. (a) What is shared nothing architecture? Why is it attractive for parallel database system? 5.

(b) Explain split and merge operations so that the existing code can be parallelized. Give an appropriate example to support your answer. 5.

(c) What is the difference between synchronous and asynchronous replication? 2.

7. (a) What are the choices for managing locks in a distributed DBMS? 5.

(b) What is the intuition behind three phase commit? What are its pros and cons relative to two phase commit protocol. 5.

(c) With time stamp ordering in distributed transactions, suppose a write operation `write(`T_1`,x)` can be passed to the data manager, because the only, possibly conflicting operation `write(`T_2`,x)` had a lower timestamp. Why would it make sense to let the scheduler postpone passing `write(`T_1`,x)` until transaction T_2 finishes? 2.

8. (a) What are the main differences between designing a relational database and an object database? 5.

(b) Explain by taking a specific relation, how one can map a relation in relational data model to objects created in an object oriented data model? Explain when two objects will be identical? 5.

(c) Define methods and messages in the context of an object-oriented data model. 2.

9. **(a)** Describe how XML data can be stored in relational DBMS. How do we map XML data to relations? Give an example. **5.**

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

```
Customer(cNumber, CName, street, city, state, pin)
Item(iNumber, cNumber, orderDate, pNumber)
Part( pNumber, description, price, quantity
```

(c) Consider the following rules: **3.**

```
reachable(X, Y) :- flight(X,Y)
reachable(X, Y) :- flight(X,Z), Reachable(Z, Y)
```

Where `reachable(X,Y)` means that city Y can be reached from city X, and `flight(X,Y)` means that there is a flight to city Y from city X.

Construct fact predicates that describes the following:

Mumbai, Delhi, New York, Los Angeles, Chicago, Paris, Frankfurt, Singapore are cities. The following flights exist:
Mumbai to New York, New York to Delhi, Delhi to Frankfurt, Frankfurt to Delhi, Frankfurt to Singapore and Singapore to Paris.

(i) Is the given data cyclic? If so, in what sense?
(ii) Consider the query reachable (Delhi, Paris)? How will this query be executed using naïve evaluation?

10. **(a)** Consider the relational schema **5.**

```
College( collegeName, location)
```

Suppose user wants to find the distances between two colleges, then which additional attribute is required in the above schema? Which type of data base you get after adding new attribute? Write two instances of the new database.

(b) What is **(i)** Transaction time database **(ii)** Valid time database **(iii)** Bi-temporal database? Give an example of each of these databases. **5.**

(c) Explain how GIS data can be describing using vector format by giving suitable example? **3.**
