(2)

M.SC. **PART – I** (OCTOBER – 2011) : **PAPER – I**

Con. 4822-11. **VD–7959**

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

N. B. : (1) Attempt any **three** questions from **each** section.
(2) Answer to the **two** sections must be written on **separate** answer sheets.
(3) **Figures** to the **right** indicate **full** marks.

Section I

Q.1

a) What is a Token? Explain finding tokens in Lexical Analysis. [5]

b) How does two dimensional array represented in memory using row major and column major form? Explain with examples. [5]

c) Explain the term Bootstrapping. [2]

Q.2

a) Write an algorithm for minimizing a DFA. Why such minimization needed? [5]

b) Develop NFA for Regular expression (a|b)* ab* a. Convert it to DFA [5]

c) Differentiate between variable calls by name and by reference [2]

Q.3

a) Consider grammar [5]
S->iCtS
S->iCtSeS
S->a
C->b
Construct a leftmost and rightmost derivation for sentence w=ibtibtaea

b) For the given precedence function show step by step parsing for string [5]
b((a a)a)b

	Z	b	M	L	a	(	)
f	1	4	7	8	9	2	8
g	1	7	4	2	7	5	9

where precedence function f & g are constructed for the grammar
Z->bMb
M->(L
M->a
L->Ma)

c) Explain term [2]
i) Context Free Grammar
ii) Handle Pruning
iii) Ambiguous Grammar

Q.4

a) Compute FIRST & FOLLOW sets for the following grammar. [5]
S->iCtSS' | a
S'->eS| ε
C->b

b) Explain context free languages. Which of the following languages are not context free? Why? [5]
1) L1={wcw| w is in (a|b)*}
2) L2={$a^n b^n$| n>=1}

c) Explain the term predictive parsers [3]

Q.5

a) What is LL(1) grammar? How to detect whether the grammar is LL(1). Write the algorithm for the constructing predictive parsing table. [5]

b) What is Canonical collection of LR(0) items. Compute it for the following grammar [5]
S->AS|b
A->SA|a

c) Show step by step parsing for the string id*id+id for the following grammar [3]
E->E+E
E->E*E
E->(E)
E->id

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Section II

6, a) What is need of syntax-directed translation scheme in compiler? 3

b) Translate a*-(b+c) into postfix form. 5

c) Suppose we have a computer with a single register and with assembly language operations LOAD,STORE, ADD and MULT with the obvious meanings. Suppose we have the following grammar for assignment statements: 5

A -> id := E
E -> E+E|E*E|(E)|id

Write algorithm for recursive descent parser for semantic routines to translate assignment statements to assembly language.

7, a) Consider the DAG for the following basic block. 2

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

b) Consider the following code: 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 is 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.

c) Prepare addressing function to access A(I,J,K) element of three dimensional array. 5

8. a) How information in symbol table can be retrieved fast? 2

b) Explain different sources of errors. Why some coding errors are very difficult to correct? Give example of such error and how compiler handles such error. 5

c) Explain algorithm to partition code into basic blocks. 5

9. a) What is dead code elimination? 2

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

c) What is flow graph? Explain the process of induction variable elimination. 5

10. a) What is cost of assembly instruction? How it is useful to decide better code generation? 3

b) Assume a target machine is a byte addressable machine with 216 bytes of memory and have eight general purpose registers R0,R1,...,R7 each capable of holding 16 bits. Generate code for expression W:=(B-A)+(B-C). Assume and explain suitable instructions for the target machine. 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

Con. 4813-11. VD–8004

(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 calculators and statistical tables is allowed.

Section I

1. (a) How circular convolution is different from linear convolution? Explain answer using some signal of your choices. 3

(b) The Z-transform of x(n) is, 5

$$X(Z) = \frac{4z}{(Z+0.5)^2}, \quad |z| > 0.5$$

Obtain x(n), using any method.

(c) What is twiddle factor? Find IDFT of a sequence with DFT [8, -2, 0, -2] 5

2. (a) Explain relationship with DFT and Z-Transform. 2

(b) What is digital filter realization? Realize the transfer function 5

$$H(z) = \frac{1 + \frac{1}{4} z^{-1}}{(1 + \frac{1}{2} z^{-1})(1 + \frac{1}{2} z^{-1} + \frac{1}{4} z^{-2})}$$ in cascade and parallel form.

(c) What is windowing? Discuss characteristics of Kaiser window. 5

3. (a) State difference between overlap-save method and overlap-add method. 2

(b) What is use of Remez Exchange algorithm? Explain the algorithm in brief. 5

(c) What are maximal ripple filter? How do you obtain maximal ripple filters? 5

4. (a) Compare FIR and IIR low pass filters. 2

(b) Explain the characterictics of Type-1 and Type-2 Chebyshev filters. 5

(c) Differentiate between fixed-point arithmetic and floating-point arithmetic. Find 2's compliment of 0.0111. 5

5. (a) What is a Gibb's phenomenon. 3

(b) Explain in detail bilinear transformation technique used for digitizing an analog filter. 5

(c) Explain Chirp Z-transform algorithm in detail. What is its purpose? 5

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Section II

6. (a) Show that if a sequence y(n1,n2) is the two-dimensional convolution of the input x(n1,n2) and a filter impulse response h(n1,n2), its z transform Y(z1,z2) is the product of the input X(z1,z2) and the filter H(z1,z2). 5
   (b) Write a note on Two dimensional frequency domain techniques. 5
   (c) What do you mean by fan in and fan out? How do they affect the performance of a logic gate? 2

7. (a) Sketch and explain the working of MOS chip. 5
   (b) Explain structure program and states for cascade FIR filter with single arithmetic elements. 5
   (c) What is purpose of Booth's algorithm? What are the steps need to be performed to achieve its goal? 3

8. (a) Explain with a block diagram a general purpose computer in Digital signal processing. 5
   (b) Explain how IIR filter is realized as a cascade of three second order sections each containing three poles and two zeros. 5
   (c) Explain How pipelining technique speeds up processing. 2

9. (a) Explain fast scratch memory technique for calculation of FFT. 5
   (b) Explain BIT-Reversal algorithm in calculation of FFT. 5
   (c) What are advantages of Fast Digital Processor (FDP) structure? 2

10. (a) Explain how homomorphic system works for processing speech. 5
    (b) Explain a modern Radar system. 5
    (c) Write a note on Radar application: Air Traffic Control (ATC) Radar System. 3

M.SC. **PART – I** (OCTOBER – 2011) : **PAPER – III**

Con. 4889-11.

VD–8058

(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) Draw **diagram** where ever applicable.
(5) Abbreviations have their usual meaning unless stated otherwise.

SECTION I

1. **(a)** Explain the multiplexing technique being used by Cellular systems for mobile communication. Write the three advantages and disadvantages of small cells used in cellular system. **5.**

(b) Why the CSMA/CD scheme fails in the wireless networks? Explain hidden and exposed terminal problem. **5.**

(c) Define Demand Assignment Multiple Access scheme with implicit reservation. **3.**

2. **(a)** Name the different subsystems of GSM system and briefly explain their working. **5.**

(b) Discuss the possible handover scenarios in the GSM system. **5.**

(c) Write note on TETRA architecture with respect to frame structure. **3.**

3. **(a)** Explain the various handover scenarios of a satellite system. **5.**

(b) Discuss the broadcast transmission and the different broadcast patterns. **5.**

(c) What are infrastructure and adhoc networks. **2.**

4. **(a)** Why there is a need for inter frame spacing. Explain the phenomenon of basic DFWMAC-DCF using CSMA/CA. **5.**

(b) Which are the different functional groups of MAC management. Explain any one of them in detail. **5.**

(c) Explain the Bluetooth piconet and scatternet. **2.**

5. **(a)** Explain the phenomenon of Reverse tunneling and IPv6. **6.**

(b) Write note on: **6.**

(i) Tunneling and encapsulation in mobile network layer.

(ii) Wireless Application Protocol.

Section II

Q6. (a) State the disadvantages of Simulation. (4)

(b) A paper seller buys the paper for Rs. 0.33 each and sells them for Rs. 0.50 each. Newspapers that are not sold at the end of the day are sold as scrap for Rs. 0.05 each. Newspapers can be purchased in bundles of 10. Thus the newspaper seller can buy 50, 60 & so on. There are 3 types of newspapers, "good", "fair", "poor" with the probability of 0.30, 0.45 and 0.25 respectively. The distribution of papers demanded on each day is as follows. The problem is to determine the optimal number of papers the newspaper seller should purchase. The lost profit from excess demand is Rs. 0.17 for each newspaper demand that cannot be satisfied. The salvage value of scrap paper is Rs. 0.05 each. Simulate the above for 20 days and record the profit from sales for each day, if he purchases 60 papers each day. (8)

	Demand Probability Distribution		
Demand	Good	Fair	Poor
40	0.03	0.10	0.44
50	0.05	0.18	0.22
60	0.15	0.40	0.16
70	0.20	0.20	0.12
80	0.35	0.08	0.06
90	0.15	0.04	0.00
100	0.07	0.00	0.00

Use the following Random numbers:

Type of news:
46, 82, 56, 95, 48, 4, 71, 92, 12, 63, 19, 90, 14, 52, 95, 79, 81, 34, 79, 61
Demand:
30, 90, 17, 15, 26, 58, 79, 60, 21, 47, 41, 85, 9, 71, 93, 16, 51, 10, 95, 92

Q7. (a) Explain Weibull distribution with its three parameters. (7)

(b) A service engineer is "beeped" each time there is a call for service. The number of beeps per hour occurs in Poisson distribution with the mean 3 per hour. (5)
(i)Find the probability that there will be no calls in one-hour period.
(ii)Find the probability that there will be 3 or more calls in one-hour period.

Q8. (a) Explain the following terms with respect to Queueing Systems: (4)
(i) Service Times (ii) Service Mechanism

(b) The weights of N.C.C Cadets are found to be normally distributed with mean 50 Kg. and s.d. 5 k.g. If a cadet is selected at random find the probability that his weight is (i) above 55 kg (ii) between 40 kg. and 65 kg. [Given the area (A) below the Standard Normal Curve between 0 and x is as follows] (4)

x	1.00	2.00	3.00
A	0.34134	0.47725	0.49865

(c) Briefly explain Chi Square Test for checking the uniformity of a given sequence of random numbers. (4)

Q9. (a) Write an algorithm to generate a sequence of 2-digit random numbers using Linear Congruential method. Also generate there random numbers between 0 and 1 with $X_0 = 27$, $a = 17$, $c = 43$ and $m = 100$. (5)

(b) Consider the following sequence of 40 random numbers. Use runs up and down test to determine whether the hypothesis of independence can be accepted for the following numbers where $\alpha = 0.05$ (8)

0.41	0.68	0.89	0.94	0.74	0.91	0.55	0.62	0.36	0.27
0.19	0.72	0.75	0.08	0.54	0.02	0.01	0.36	0.16	0.28
0.18	0.01	0.95	0.69	0.18	0.47	0.23	0.32	0.82	0.53
0.31	0.42	0.73	0.04	0.83	0.45	0.13	0.57	0.63	0.29

[Given: the area below the Standard Normal Curve between ± 1.96 is 0.95]

Q10. (a) Explain with the help of a diagram the three steps in model building. (6)

(b) Explain the terms random splitting and pooled process with respect to a Poisson process. (4)

(c) Discuss AR(1) time series model. (3)

M.SC. **PART – I** (OCTOBER – 2011) : **PAPER – IV**

Con. 4880-11. **VD–8112**

(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 a data warehouse. Why there is a need of a data warehouse? How does it differ from a database? What are the characteristics of a data warehouse? **5.**

(b) Explain the steps involved in building a data warehouse. **5.**

(c) What are different basic data transformation tasks performed in data staging area? Substantiate your answer with examples. **3.**

2. (a) Following is the fact table for a store chain application: **5.**

```
Sales_Transaction( date_key, product_key, sales_ID,
                   store_key, grossProfit)
```

Write dimension tables for above fact table and depict the relation between the fact and dimension tables using star schema. Write a query using relational algebra for: Find the gross profit of a product name 'Pencil" from a store name "Power" on 28/3/10.

(b) What are different data integration problems faced by the user in data staging area? Explain various methods to resolve it. **5.**

(c) Explain with example factless fact table. **3.**

3. (a) Consider the following whether report: **5.**

Outlook			Temperature			Humidity			Windy			Play	
	Yes	No		Yes	No		Yes	No		Yes	No	Yes	No
Sunny	2	3	Hot	2	2	High	3	4	False	6	2	9	5
Overcast	4	0	Mild	4	2	Normal	6	1	True	3	3		
Rainy	3	2	Cold	3	1								

Use Bayes rule and decide if there is a cricket play with outlook = sunny, temperature = cool, humidity = high, windy = true.

(b) Explain how decision tree is created by considering the following information called "cheat " **5.**

Tid	Refund	Marital Status	Taxable Income	Cheat
1	Yes	Single	125 Cr	No
2	No	Married	100 Cr	No
3	No	Single	70 Cr	No
4	Yes	Married	120 Cr	No
5	No	Divorced	95 Cr	Yes
6	No	Married	60 Cr	No
7	Yes	Divorced	220 Cr	No
8	No	Single	85 Cr	Yes
9	No	Married	75 Cr	No
10	No	Single	90 Cr	Yes

(c) Explain why there is a need of data mining. Differentiate between data mining processing and database processing with respect to query, data and output of a query. **2.**

[TURN OVER

4. (a) How can we define the distance between two clusters using single and complete linkage? Explain with example. 5.

(b) Define and draw dendrogram for the following adjacency matrix. 5.

Item	A	B	C	D
A	0	1	4	5
B	1	0	2	6
C	4	2	0	3
D	5	6	3	0

(c) Explain CLARNS algorithm. 2.

5. (a) Define an association rule. Can you use it for prediction? Justify your answer. Is there a difference between classification rule and association rule? Explain. 5.

(b) Explain how to generate Frequent pattern (FP) tree for the following data sets with minimum support 3: 5.

TID	Items bought
1	{f, a, c, d, g, i, m, p}
2	{a, b, c, f, l, m, o}
3	{b, f, h, j, o}
4	{b, c, k, s, p}
5	{a, f, c, e, l, p, m, n}

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

SECTION II

6. (a) Compare and contrast a distributed DBMS with a parallel DBMS. Under what circumstances would you choose a distributed DBMS over a parallel DBMS? Justify your answer. 5.

(b) Explain by giving suitable example round-robin and range techniques for partitioning database. 5.

(c) What are the advantages of distributed database? 2.

7. (a) Explain with example dead locks in distributed database? 5.

(b) Consider the following transactions T_1 and T_2 processed at sites S_1 and S_2. 5.

T_1	
S_1	S_2
R(x)	
W(x)	
	R(y)
	W(y)

T_2	
S_1	S_2
	R(y)
	W(y)
R(x)	
W(x)	

Write schedules related to sites S_1 and S_2. Is it locally and globally serializable? Explain.

(c) Define local and global histories maintained at the site in distributed database. 2.

8. (a) Explain an abstract data type in object oriented database. Why there is a need to have this data type? 5.

(b) When do you say that two objects are shallow equal and deep equal? Is it possible that two objects are deep equal but not shallow equal? If not then explain why this is not possible. **5.**

(c) Explain nested relational data model by giving suitable example. **2.**

9. (a) What do you understand by data containing XML document? Give suitable example to support your answer. **5.**

(b) What do you mean by liner datalog program? Is the following program linear and of first order? **5.**

```
father (X, Y) :- parent (X, Y), man (Y)
ancestor(X, Y) :-  parent (X, Y),
ancestor(X, Y) :-  parent (X, Z), ancestor (Z,Y)
```

(c) What is a trigger? Explain three parts of a trigger. **3.**

10. (a) What is a R-tree? What is the structure of data entries in R-tree? How can we minimize the overlap between bounding boxes when splitting nodes? **5.**

(b) What is the difference between temporal and ordinary database? Justify your answer with suitable relations. **5.**

(c) How does spatial DBMS different from GIS? Explain. **3.**
