M.Sc. (Computer Science) Part- I

Paper -II

Digital Signal Processing

April: 2015

QP Code : 12846

(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.	What is twiddle factor? Find the IDFT of sequence with DFT [2, -1, 0, 3]	6
	b.	Determine the impulse response and frequency response of the filter define by $y(n)=x(n)+x(n-1)+by(n-1)$	6
2	a	With suitable figures explain 'in-place' in DIT and DIF algorithms.	6
	b	Let $x(n)=\{2,2,-2,2,-1,-2,-2,-1,-1,1,2,-1\}$ and $h(n)=\{2,2\}$ Compute $x(n)*h(n)$ using overlap save method. Explain each step in detail.	6
3	a.	Determine Direct form II realization for following LTI system $2y(n) + y(n-1) - 4y(n-3) = x(n) + 3x(n-1)$	6
	b.	Realize the system given by difference equation, $y(n) = -0.1y(n-1) + 0.3y(n-2) + 0.5x(n) - 0.14x(n-2)$ Use parallel form, Is this system stable? Determine its impulse response.	6
4	a.	Explain mapping of S-plane to Z-plane in the design of IIR filters.	6
	b.	Consider second order LTI system. Discuss cascade form realization of FIR systems.	6
5	a.	Why Chirp z transform (CZT) is an efficient algorithm? Discuss operations in CZT.	6
	b.	What is the purpose of Bluestein's algorithm? How it is achieved? State the major significance of Bluestein algorithm.	6

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Section II

6	a.	Explain two-dimensional digital filter design considerations using System Transfer function.	6
	b.	What is fan-in and fan-out? Design a system to determine largest of two-3 bit numbers. Assume the number system deals with only positive numbers.	7
7	a	Calculate DFT of [3 1; 1 2] using any method.	6
	b	Discuss congruential method technique for generating pseudo-random numbers.	7
8	a.	Explain in place 16 point, radix 4 DIT FFT with normally ordered input and digit reversed output.	6
	b.	Discuss various ways for incorporating a cache memory into a computer.	7
9	a.	Discuss real time convolution via FFT using a single RAM and one AE.	6
	b.	Discuss overall FDP structure.	7
10	a.	Compare Radix 2 and Radix 4 Pipeline FFTs.	6
	b.	Explain Excitation network for voiced fricatives.	7

M.Sc. (Computer Science) Part- I

Paper III

Mobile Computing and Computer Simulation and Modeling

April: 2015

QP Code :' 12900

Time: 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 is allowed.
(5) Abbreviations have their usual meanings unless stated otherwise.

Section I

Q1.	(a)	What is multiplexing? Comparer FDM with TDM.	6
	(b)	Explain Direct Sequence Spread Spectrum.	4
	(c)	Write down the advantages and disadvantages of Cellular systems	2
Q2.	(a)	What is Handover? Explain different handover mechanisms in GSM.	6
	(b)	Compare classical Aloha and slotted Aloha techniques.	4
	(c)	Explain the concept of Hidden and Exposed terminals.	2
Q3.	(a)	Explain different types of satellite orbits with their applications.	6
	(b)	Explain Digital Video Broadcasting and transport mechanism used in it.	4
	(c)	Define elevation angle and Footprint.	2
Q4.	(a)	List and explain Wireless ATM services.	6
	(b)	Explain the protocol architecture of HIPERLAN.	4
	(c)	Define mobile QOS.	2
Q5.	(a)	Write a note on mobile IP and explain the process of IP Packet delivery.	6
	(b)	Explain the concept of snooping TCP with its advantages.	4
	(c)	Write a note on Wireless Transaction Protocol.	2

Section II

Q6. (a) Define Simulation. Explain the advantages and disadvantages of simulation. 5

(b) A paper seller buys the paper for Rs. 0.31 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 each Rs. 0.05 each. Newspapers can be purchased in bundles of 10. Thus the newspaper seller can buy 50, 60 & so on. There are three types of newspapers, "good", "fair" and "poor" with the probability of 0.30, 0.45 and 0.25 respectively. The distribution of papers demanded on each day is as below. 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 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) 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 haircut. 7

(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?

(b) A pair of unbiased dice is rolled once. Find the probability distribution of the minimum of two numbers occurring on the uppermost face of the dice. Also find the mean and standard deviation. 6

Q8. (a) Explain the steps to perform Gap Test for Random Numbers. 4

(b) Customers arrive at a railway reservation counter at random, at a rate of 50 customers per hour. There are 20 reservation clerks, each serving 5 customers per hour on an average. 4

i) Find an average number of busy servers.
ii) Find the long run average utilization of a server.
iii)If the railway authorities want to reduce the number of servers, what is the

minimum number of servers needed to have a stable system?

(c) Explain the steady state behavior of finite population models (M/M/C/K/K) 5

Q9. (a) Describe the Uniformity and independence property of a sequence of random numbers. 5

(b) Consider the sequence of 30 random numbers. Use runs above and below the mean test to determine whether the hypothesis of independence can be accepted for the following number 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

[Given the area below the Standard Normal Curve between $\pm$ 1.96 is 0.95]

Q10. (a) Define the Poisson process and explain its assumptions. 6

(b) Briefly explain the following terms in the context of simulation models: 4
(i) Verification (ii) Validation

(c) Write the steps for acceptance-rejection technique. 3

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M.Sc. (Computer Science) Part- I

Paper IV

Data Warehousing and Mining and Advanced Database Systems.

April: 2015

QP Code : 12953

[Total marks: 75]

N. B.: (1) Attempt any **three** questions from **each section.**
(2) Answers to the two sections must be written in **same answer sheet.**
(3) Figures to the right indicate full marks.
(4) Use of simple calculators is allowed.

Section I

1 a. Differentiate between operational database and datawarehouse. 6

b. What is single platform option to implement data warehouse? What are the disadvantages of this option? 6

2 a. What do you understand by dimensional schema? Following is the fact table for an application 6

Fact(store_id, location_id, product_id, date_id, sales_amt)

Form your own dimensions to show relations between facts and dimensions using star schema

b. Describe different stages of deployment in data warehouse. 6

3 a. What are the expectations of users from web-enabled data warehouse? 6

b. Explain different stages of knowledge discovery process. 6

4 a. Define clustering problem. Give difference between classification and clustering problems. 6

b. What is association rule? Explain support and confidence of the rule with example. 6

5 a. Explain Decision tree with example. What are its advantages and disadvantages? 6

b. Write a short note on web content mining. 6

Section II

6. a. Explain Serializability in distributed systems. Discuss different techniques to distribute across different sites in concurrency control of distributed databases. 6.

b. What are different fragmentation techniques to distribute database. Write a relational algebra query to fragment the database using all techniques. Also show the tuples in every fragment 7.

Department(Dnum, Dname, Location)
Employee(EmpNum, Name, Salary ,Dnum, Pnum)
Project(Pnum, Projname, WorkingHours)

7 a. Discuss different data partitioning methods to horizontally partition the data for parallel query evaluation. Illustrate with examples. 6

b. Compare and contrast distributed and parallel databases .Explain different layers of transparencies provided in distributed databases. Give example to illustrate your answer by considering the global relation supplier(sno, Sname, sCity) with two horizontal fragments say supplier1 with scity="Mumbai" and supplier2 with sCity="Pune" 7

8 a. Compare OODBMS and RDBMS. What are the challenges faced by the 6

OODBMS

b. Consider the relation for the schema 7

Person(PerNo, Pername, Peraddress, Pertelephone).

Write any two objects and possible types of attributes. When two objects are equal?

9 a. What is semi-structured data model? Create data containing document using XML for the following relational schemas by taking single tuple of your choice. 6

Branch(bNumber, street, city, pincode)
Staff(sNumber, bNumber, fname, lname, salary, pNumber)
PropertyForRent(pNumber, street, type, rooms)

b. What are characteristics of spatial data? What are the difference between spatial range queries and nearest neighbor queries and spatial join queries? Give example. 7

10 a. What is Geographical Information system? Explain different format used to represent Geographic data. 6

b. When do you say that datalog rule is safe? Consider the following rule set 7

Person(Priya), Person(Sameer), Rich(Priya)

Is the rule Likes(X, Y) :- Rich(Y) is safe? If unsafe Make it safe and viceversa.

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M.Sc. (Computer Science) Part- I

Paper - I

Principles of Compiler Design.

April: 2015

QP Code : 12792

(3 hours) [Total marks: 75]

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

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

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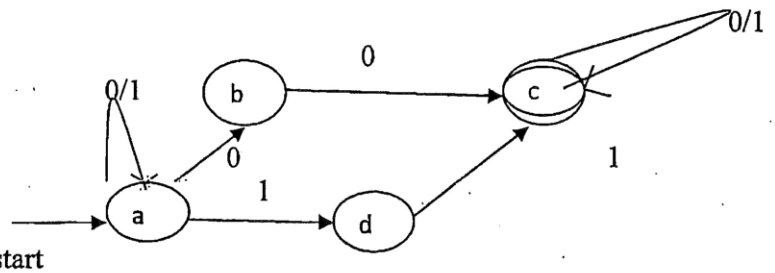
Section I

Q.1 (a) Define NFA and DFA and convert the given NFA to DFA. 06



(b) Explain in brief : input buffering and lexical analyzer. 06

Q.2 (a) Explain with suitable example the concept of Ambiguous grammar. 06

(b) Minimize the following DFA. 06

delta	a	b
Q_0	Q_1	Q_2
Q_1	Q_1	Q_3
Q_2	Q_0	Q_1
Q_3	Q_1	Q_4
Q_4	Q_3	Q_1

Where M= $(\{Q_0,Q_1,Q_2,Q_3,Q_4\},(a,b)$, delta,Q_0, $\{Q_2,Q_4\})$

Q.3 (a) Consider the grammar: 06

S→iCtS

S→iCtSeS

S→a

S→b

Construct a leftmost and rightmost derivation for the string: ibtibtaea

(b) Compute First and Follow for the following: 06
S → ABBA
A→a
A→ ε
B→b
B→ ε

Q.4 (a) Consider the following grammar and construct predictive parsing table. 06
E→ TE'
E'→+TE'
E' →ε
T→FT'
T'→*FT'
T' →ε
F→ (E)
F→id

(b) Write a note on RDP with suitable example. 06

Q.5 (a) Construct LALR parsing table for the following: 06
S'→S
S→CC
C→cC
C→d

(b) Construct the parsing table and the production rules for the LR parser moves given below 06
0
0 1 2
0 B 4
0 E 3
0 E 3 + 6
0 E 3 + 6 1 2
0 E 3 + 6 B 8
0 E 3$
Find the input string parsed by the parser.

Section II

Q.6 (a) Define Three Address Code, Triple and Quadruples a with suitable examples. 06

(b) Draw Syntax Trees for the following: 07

1) If a=b then a=c+d else b=c−d
2) a*(b+c)/d

Q.7 (a) How the intended translation of switch statement is done by the compiler? 06

(b) Discuss the memory organization for a C program. 07

Q.8 (a) Define following: 06

1) Ud-chaining
2) Live variable
3) Constant folding
4) Induction variable

(b) Convert following three-address code into a flow graph: 07

1) prod=0
2) i=1
3) T1=4*i
4) T2=addr(A) −4
5) T3=T2[T1]
6) T4=addr(B) −4
7) T5=T4[T1]
8) T6=T3*T5
9) prod=prod+T6
10) i=i+1
11) If i<=20 goto 3

Q.9

(a) What is directed acyclic graph (DAG)? Explain algorithm for constructing DAG. 06

(b) Explain loop unrolling and loop jamming techniques. 07

Q.10	(a)	State and explain different types of errors that a compiler needs to handle.	06
	(b)	Consider the following Three-Address code statements and write possible code sequence in assemble level language. [Assume suitable machine architecture] T=A−B U=A−C V=T+U W=V+U	07
