Con. 6397–12. **RT–8782**

(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) Explain Intermediate Code Generation phase in Compiler with example 6
   b) What are different types of Semantic specification of Language? 4
   c) Explain term Coercion of Types. 2

2. a) Draw NFA for given Regular Expression (a*|b*)abb and convert it to DFA by using ε-Closure. 6
   b) State and explain the formula to calculate the position of A[i,j] in 2-D fixed dimensional row-major form array 4
   c) Explain the term Lookahead operator. 2

3. a) What is left recursion in top down parsing? How to eliminate left Recursion in following grammar 6
   E-> E+T | T
   T->T*F | F
   F->(E) | id
   b) Find leftmost & rightmost derivation for (((a,a), ^,(a)),a) for grammar below 4
   S->a | ^ | (T)
   T-> T,S | S
   c) Explain term Precedence functions 2

4. a) Explain role of FIRST & FOLLOW sets in predictive parsing. State the steps to create FIRST & FOLLOW sets for the grammar of yours choice. 6
   b) Which of the following languages are not context free? Why? 4
   1) L1={ww^R| w is in (a|b)*} w^R is w reverse
   2) L2={$a^m b^m c^n$ | n>=1 and m>=1}
   c) Write the algorithm for the predictive parsing from parsing table. 3

5. a) Write the algorithm for constructing SLR parsing table. Explain the step of parsing from the SLR parsing table with example. 6
   b) Check whether the following grammar is LL(1)? 4
   S->aABbCD | ε
   A->ASd | ε
   B->Sac | hC | ε
   C->Sf | Cg
   D->aBD | ε
   c) What is Canonical Collection of LR(0) items? Explain with example. 3

[TURN OVER

Section II

6. a. Convert the following infix expression to postfix expression. 3
a*(b+c)+c*a
Evaluate the postfix expression for a=3, b=2 and c= 4

b. Describe in detail giving example any one method of translating Boolean expression 5

c. What are Hash tables? State the significance of Hashing function in obtaining address of a desired table. 5

7. a Translate the following assignment statement to any form of intermediate code: 2
A[I,J] := B[I,J] + D[I,J]

b Suppose P(X,Y) is a C procedure and it is called by P(A+B, C). Show the intermediate code generated for the call and return. Make arbitrary assumptions about the locations of A, B and C in the activation record of the calling procedure. 5

c. Consider the following matrix subtraction 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 subtraction program.
Partition the program into basic blocks.

8. a. What is constant folding? 2

b. Suppose we have an expression, all of whose operands are integers. Give an algorithm to determine the minimum number of distinct temporary names needed to evaluate the expression, assuming no algebraic laws may be applied to alter the expression. For example, A+B*C requires one temporary (for B*C). 5

c. What is peephole optimization? State and discuss different methods of peephole optimization. 5

9. a. What is strength reduction? Give example. 3

b. Explain loop unrolling and loop jamming optimization techniques. 5

c. What is DAG? Explain algorithm for constructing DAG. 5

10. a. Why good code generation is difficult? 3

b. Explain Activation record for following C Procedure 5

```
int add(intx,int y)
        {
         int t=0;
         t=x+y;
         return t;
}
```

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

M.SC. **PART – I** (OCT - 2012): **PAPER – II**

Oct - 2012
M.Sc - I
Computer scien - II

Con. 6515–12.

RT–8830

(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.

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(6) Use of simple calculators and statistical tables is allowed.

Section I

1 a. Define DFT. Assume two finite duration sequences $x_1(n)$ and $x_2(n)$ are linearly combined. Let $x_3(n)= a\,x_1(n)+ bx_2(n)$.What is DFT of $x_3(n)$? Establish relation between DFT and z-transform. 6

b. Find the convolution of the following using z-Transform. x(n)={1,2,1} and h(n)={1,1,1,} 4

c. What is the importance of Z-transform? 2

2 a. What do you mean by digital filter realization? Develop a direct form I and II for a third order IIR transfer function (HZ)= $\frac{0.28z^2+0.319z+0.04}{0.5z^3+0.3z^2+0.17z-0.2}$ 6

b. Find the impulse response of the causal system by the difference equation y(n)-y(n-1)=x(n)+x(n-1).Test the stability. 4

c. Define transfer function of a system. 2

3 a. What the principle of designing FIR filter using frequency sampling method? Explain in detail. 6

b. State and explain alternation theorem. 4

c. Explain why Kaiser window is the favourite window for many digital filter designers. 2

4 a. What is Matched z transformation? Convert the analog filter to a digital filter whose transfer function is $H(s) = \frac{s^2+2s+5626}{s^2+2s+2}$ .Use Matched z transform. 6

b. Compare between Impulse Invariant and Bilinear Transformation. 4

c. Define Magnitude-Squared Response and explain its importance in IIR filter designs? 3

5 a. What is meant by radix-2 FFT? Compute the DFTs of the sequence $x(n)=\sin(n\pi/2)$,where N=4 using DIT-FFT algorithm. 6

b. What do you mean by limit cycle oscillations? A digital system is characterized by the difference equation y (n) =x(n)+0.7 y (n-1). Determine the dead band of the system when x(n)=0 and y(-1)=13. 4

c. What is meant by 'in-place' in DIT and DIF algorithms? 3

[TURN OVER

Section II

6 a. Why for 2D FIR filters problem of stability do not exist? 3

b. Explain various basic 2D discrete signals. What are different applications of 2D DSP? 5

c. Draw block diagram for four-bit adder and explain working of it. 5

7 a. Compare bipolar and unipolar devices. 3

b. Draw neat figure to show hierarchy of hardware leading to signal processing algorithms. For digital signal processing which computer will be useful? 5

c. Explain structure program and states for FIR implementations using two parallel arithmetic elements. 5

8 a. What is pipelining technique? How does pipeline technique speed up processing? 2

b. Compute DFT of following 2D discrete signal using any method of your choice. 5

$x = [1, 0 ; 2, 1]$

c. Explain FFT computation using fast scratch memory. 5

9 a. Draw the structure of a simplified general-purpose computer. 2

b. Explain hardware realization of a digital frequency synthesizer. 5

c. Explain the concept of cache memory and state the various ways by which it may be incorporated into a computer. 5

10 a. Explain any one radar parameter. 3

b. Explain the input-output problems for real time processing in context of digital signal processing. 5

c. With neat figure explain the block diagram of radar model leading to ambiguity function. 5

M.SC. PART – I (OCT - 2012) PAPER – III

M.Sc (Part-I) - P-III

Con. 6382-12. **RT-8878**

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

19/10/12

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

1. (a) State and Explain the concept of Advanced frequency shift keying and Advanced phase shift keying. **6**
   (b) Write down the advantages and disadvantages of Cellular systems. **4**
   (c) Explain Direct Sequence Spread Spectrum (DSSS). **2**

2. (a) Explain GSM system architecture with the help of diagram. **6**
   (b) Compare classical Aloha and Slotted Aloha techniques. **4**
   (c) Explain the concept of Hidden and Exposed terminals. **2**

3. (a) What are different types of satellite orbits ? Explain with their applications. **6**
   (b) Explain Digital Audio Broadcasting and transport mechanism used in it. **4**
   (c) Define elevation angle and Footprint. **2**

4. (a) Explain Tunneling and Reverse tunneling in mobile network layer. **6**
   (b) Compare Infra red Vs Radio transmission. **4**
   (c) Define Mobile QOS. **3**

5. (a) List the entities of mobile IP and describe data transfer from mobile node to fixed node and vice versa. **6**
   (b) Explain the concept of snooping TCP with its advantages. **4**
   (c) Write a note on Wireless Application Protocol. **3**

Section II

6. (a) What is the model of a system? Explain different types of models in simulation. **4**
   (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 and 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

[TURN OVER

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

7. (a) State the pdf, mean, variance and cdf of Triangular distribution and solve the following :— 7
The central processing requirements, for programs that will execute, have a triangular distribution with a = 0.05 second, b = 1.1 seconds and c = 6.5 seconds.
Determine the probability that the CPU requirement for a random program is 2.5 seconds or less.

(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 haircut. 5
(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 ?

8. (a) Explain the following terms with respect to Queuing Systems :— 4
(i) Service Time
(ii) Service Mechanism.

(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 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) Write down the steps to perform Gap Test for Random Numbers. 5

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. 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 ± 1.96 is 0.95]

10. (a) Explain the terms random splitting and pooled process with respect to a Poisson process. 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. **PART – I** (OCT - 2012): **PAPER – IV**

Oct - 2012
M.Sc – I
Computer Sci... - V

RT-8926

Con. 6379-12.

(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 term OLAP and explain OLAP operations: roll-up, drill-down, slicing and dicing. **5**

(b) Explain the architectural plan in detail of a data warehouse. **5**

(c) Define Data warehouse by giving its application. **3**

2. (a) Following is the fact table : **5**

```
Transaction( product_key, customer_key,store_key,
             grossProfit)
```

Write dimension tables of your choice for above fact table and depict the relation between the fact and dimension tables using star schema. Now consider another table of your choice and connect it to any one of the dimension table. Which schema is generated ?

(b) What is the significance of the ETL process ? What are different basic data transformations task performed in ETL process ? **5**

(c) Write a short note on data scrubbing. **3**

3 (a) For each attribute of the following table write three classification rules of your choice and find the total error corresponding to each attribute using 1R classifier. According to you which is the best attribute and corresponding rules. Justify your answer. **5**

Outlook	Temperature	Humidity	Windy	Class
Sunny	Hot	High	False	N
Sunny	Hot	High	True	N
Overcast	Hot	High	False	Y
Rain	Mild	High	False	Y
Rain	Cool	Normal	False	Y
Overcast	Cool	Normal	True	Y
Sunny	Mild	High	False	N
Sunny	Cool	Normal	False	Y

(b) Define entropy and gain of an attribute in information theory. Consider the following information about a weather report where one of the attribute is "Outlook". Compute entropy and gain for an outlook. **5**

Outlook	Play = yes	Play = no	Total
Sunny	3	4	7
Overcast	5	0	5
Rainy	4	3	7
Total	12	7	19

(c) Explain how to construct a classification model for a training set and verify using test set by considering a classifier rule. **2**

4. (a) Explain k-mean clustering method using the set {2, 4, 10, 12, 3, 20, 30, 11, 25 } by dividing a set into three clusters. Initially begin with three clusters with mean 3, 4 and 11. **5**

(b) Draw a dendrogram using AGNES for the following distance matrix : **5**

	A	B	C	D	E
A	0	1	2	2	3
B	1	0	2	4	3
C	2	2	0	1	5
D	2	4	1	0	3
E	3	3	5	3	0

(c) What is cluster Analysis? What do you mean by outliers in cluster analysis ? Is it true that "Clusters are formed using un-supervised learning"? Justify your answer. **2**

[TURN OVER

5. (a) Calculate support and confidence for the rule YP → X with the help of following information : **5**

TID	Item Bought
1	{R,X,P,Y}
2	{ P,X,Z,Q,Y}
3	{Z,X,Y,Q}

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

TID	Items bought
01	{r, y, t, a, b, c, d, f}
02	{y, g, t, r, h ,d, i}
03	{g, r, x, y, i}
04	{g, t, z, b, q}
05	{y, r, t, s, h, q, d, v}

(c) What do you mean by frequent item set? State Apriori algorithm. If {a, f} is not frequent then can you say that {a, d, f} is frequent? Explain. **2**

SECTION II

6. (a) Discuss how each of the following operators can be paralyzed using data partitioning: scanning, sorting, join. Illustrate with example. **5**

(b) Briefly describe and compare synchronous and asynchronous distributed database. **5**

(c) Differentiate between parallel processing and parallel databases. **2**

7. (a) Explain how Two-phase commit protocol works to commit distributed transaction. **5**

(b) Explain different types of transparencies provided in distributed DBMS. Give example to illustrate your answer. **5**

(c) What are the different types of fragmentation to divide the database? Explain. **2**

8. (a) List the advantages and disadvantages of OODBMS. **5**

(b) Why there is a need to define a new ADT. Illustrate by giving suitable examples. **5**

(c) Define any two classes or types in OODBMS and explain 1:M relationships between them. **3**

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

(b) What is a datalog program? Consider the Flights relation : **5**

```
Flights(flno: integer,from:string,to:string,
        distance:integer,depart:time,arrives:time)
```

Write the following queries using Datalog :

(i) Find the *flno* of all flights that depart from Mumbai.

(ii) Find all cities reachable from Mumbai through a chain of one or more connecting flights.

(c) Define the term fixed point and least fixed point. What can you say about least fixed points for Datalog programs ? **3**

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

Lake (LakeNo, LakeName)

Suppose user wants to know the dimensions of a lake, then which additional attribute is required in the above schema? Which type of data base you get after adding new attribute? How is it different from traditional database?

(b) What is the difference between temporal and ordinary database? What are the advantages of temporal database ? **5**

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