

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

## Section I

1. a) What is Optimization phase in Compiler? Explain Local Optimization with example 6  
 b) Explain parameter passing with call by reference, call by name with example 4  
 c) What is l-value and r-value? 2
2. a) What is Storage Management? Explain static, dynamic and heap allocation. 6  
 b) Construct NFA for following regular expression  $(ab^*|abb)ab$  4  
 c) State the need of Minimizing number of states of DFA. 2
3. a) What are precedence functions? Generate the precedence function for the following precedence matrix. 6

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

- b) Write a short note on CFG. State the components of it and its notational conventions. 4  
 c) What is Ambiguous grammar? 2
4. a) Compute FIRST & FOLLOW sets for each NT. 6  
 $S \rightarrow aABbCD \mid \epsilon$   
 $A \rightarrow ASd \mid \epsilon$   
 $B \rightarrow Sac \mid hC \mid \epsilon$   
 $C \rightarrow Sf \mid Cg$   
 $D \rightarrow aBD \mid \epsilon$
- b) Explain with reason which languages are context free 4  
 1)  $L1 = \{wcw^R \mid w \text{ is in } (a|b)^*\}$   $w^R$  stands  $w$  reverse  
 2)  $L2 = \{a^n b^m c^n \mid n \geq 1 \text{ and } m \geq 1\}$
- c) Explain the terms handle & handle pruning with example 3
5. a) Check whether the following grammar is LL(1)? Construct predictive parsing table for the grammar. 6  
 $S \rightarrow iCtSS' \mid a$   
 $S' \rightarrow eS \mid \epsilon$   
 $C \rightarrow b$
- b) Compute LR(0) items for the following grammar 4  
 $S \rightarrow AS \mid b$   
 $A \rightarrow SA \mid a$
- c) Write an algorithm for constructing LALR table. 3

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  
 $S \rightarrow E\$$   
 $E \rightarrow E+E$   
 $E \rightarrow E * E$   
 $E \rightarrow (E)$   
 $E \rightarrow I$   
 $I \rightarrow I \text{ digit}$   
 $I \rightarrow \text{digit}$   
 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  $h(i) = i \bmod 10$ . 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? 3  
 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

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### Section I

1. a. What is digital filter realization? Obtain direct form II and cascade form realizations for the transfer function of an FIR system given by  $H(z)=(1-1/4z^{-1}+3/8z^{-2})(1-1/8z^{-1}-1/2z^{-2})$  6
- b. Find the z-transform of the exponential  $x(n)=0, n<0; x(n)=e^{j\omega n}, n \geq 0$ . Check Stability of the system. 4
- c. What are the drawbacks of direct form realization of IIR system? 2
2. a. Find the magnitude, phase and step responses for the system characterized by the difference equation  $y(n)=1/6x(n)+1/3x(n-1)+1/6x(n-2)$  6
- b. Find the cross-correlation of the following using z-Transform.  $x(n)={4,-2,1}$  and  $h(n)={1,1,1,1}$  4
- c. Define Step response of the system. 2
3. a. What is purpose of Remez Exchange algorithm? Explain in brief steps need to be performed in Remez Exchange Algorithm. 6
- b. Derive the frequency response of Linear phase FIR filter whose impulse response and filter length N is odd. 4
- c. What is the effect of truncating an infinite Fourier Series into a finite series? 2
4. a. What is bilinear transformation? What are the advantages and disadvantages of transformation? Distinguish between Butterworth and Chebyshev (Type-I) filter. 6
- b. Convert the analog filter to a digital filter whose transfer function is  $H(s) = \frac{2}{(s+2)(s+3)}$ . Use Impulse Invariant technique. 4
- c. Define Butterworth Low-pass Filter. State the properties of Butterworth Low-pass Filter. 3
5. a. What is purpose of the Chirp Z transform? What are advantages of this algorithm? Compare it with Bluestein's Algorithm. 6
- b. What are the different quantization methods? Discuss their effects on all types of number representations. 4
- c. What are the differences and similarities between DIF and DIT algorithm? 3

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Section II

6. a. Find output of an LTI system whose impulse response is 3  

$$h(n_1, n_2) = a^{n_1 n_2} \quad -\infty \leq n_1, n_2 \leq \infty$$
 and system is excited by signal  

$$x(n_1, n_2) = \begin{cases} 1 & 0 \leq n_1, n_2 \leq 2 \\ 0 & \text{otherwise} \end{cases}$$
- b. What is the output of LTI 2-D filters with the help of 2-D difference equation? 5
- c. Why signal processing is done in frequency domain? Explain two dimensional frequency domain techniques. 5
7. a. Explain 2-D convolution property of z transform. 3
- b. Explain how to determine stability of IIR filters directly from their 2-D z transforms. 5
- c. Design one-bit adder which accepts as inputs 3 bits and generates a sum bit and a carry output bit. 5
8. a. What are advantages and disadvantages of FDP structure? 2
- b. State and explain steps needed to perform floating additions. Explain hardware design for floating additions. 5
- c. How direct form FIR filter are realized? 5
9. a. How pipelining technique speeds up processing? 2
- b. State different methods of increasing computer speed. Explain any one in detail. 5
- c. Describe Lincoln Signal Processor 2 (LSP2) 5
10. a. Define pitch period and pitch frequency. 3
- b. Explain any one radar application. 5
- c. Explain how homomorphic system works for processing speech. 5
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Con. 2466-12.

**SV-1032**

(3 Hours)

**[Total Marks : 75**

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**Section I**

1. (a) Explain the multiplexing technique used by cellular systems for mobile communications. Write the advantages and disadvantages of small cells used in cellular system. **6**
- (b) Differentiate Demand assigned multiple access scheme with respect to explicit and implicit reservation. **4**
- (c) Explain the radiation pattern of directed antenna and sectorized antenna. **2**
2. (a) Explain with the help of diagram GSM TDMA frame and the types of handover in GSM system. **6**
- (b) What are the different components of DECT system architecture reference model? Draw the diagram for the same. **4**
- (c) Name basic applications for satellite communication and elaborate different handover scenarios in satellite systems. **2**
3. (a) Discuss classes of handover in UMTS and localization and routing with respect to Satellite systems. **6**
- (b) What are different inter frame spacing in medium access control layer? Elaborate scenario of basic DFWMAC-DCF with several competing senders drawing the diagram. **4**
- (c) What are infrastructure and adhoc networks? Explain them with architectural diagram of IEEE 802.11. **2**
4. (a) Discuss beacon transmission in a busy 802.11 infrastructure and adhoc network. **6**
- (b) Elaborate the reason that has led to the development of WATM system. **4**
- (c) Define formation of Blue tooth piconet and scatternet. **3**
5. (a) Explain the registration process of a mobile node through the foreign agent and directly with the home agent. Also discuss IP-in-IP encapsulation process. **6**
- (b) What do you understand by mobile adhoc networks and mobile TCP? **4**
- (c) Problems with HTTP and HTML have led to different proprietary and standardized solutions. Discuss any three approaches that support wireless access. **3**

**Section II**

6. (a) Define Simulation. State advantages of Simulation. **4**
- (b) A company manufactures 200 bicycles per day. Depending upon availability of raw materials and other conditions, the daily production has been varying from 196 bicycles to 204 bicycles, 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

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The bicycles are transported in a specially designed three-storied lorry that can accommodate only 200 bicycles.

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 bicycles waiting in the factory.
- (ii) The average number of empty spaces on the lorry.

7. (a) Explain any four guidelines for selection of Simulation software. 4
  - (b) A production process manufactures computer chips on the average at 2% non-conforming. Every day a random sample of size 25 is taken from the process. If the sample contains more than two nonconforming chips, the process will be stopped. Determine the probability that the process is stopped by the sampling scheme. 5
  - (c) State and Explain the mean, variance and cdf of Uniform distribution. 3
  
  8. (a) Explain the following terms with respect to Queuing Systems :— 4
    - (i) System Capacity.
    - (ii) Arrival Process.
  - (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 mins. 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) Briefly explain Chi Square Test for checking the uniformity of sequence of random numbers. 5
  
  9. (a) Write an algorithm to generate random sample of size  $n$  from exponential distribution using inverse transform technique. 5
  - (b) Use the Runs Up and Runs Down Test to determine whether the hypothesis of Independence can be accepted for the following set of numbers. Use  $\alpha = 0.05$ . 8  
 [Given : the area below the Standard Normal Curve between  $\pm 1.96$  is 0.95]
- |      |      |      |      |      |      |      |      |      |      |
|------|------|------|------|------|------|------|------|------|------|
| 0.37 | 0.51 | 0.54 | 0.01 | 0.81 | 0.28 | 0.69 | 0.34 | 0.75 | 0.49 |
| 0.72 | 0.43 | 0.56 | 0.97 | 0.30 | 0.94 | 0.96 | 0.58 | 0.73 | 0.05 |
| 0.06 | 0.39 | 0.84 | 0.24 | 0.40 | 0.64 | 0.40 | 0.19 | 0.74 | 0.62 |
10. (a) Discuss three steps in model building with the help of diagram. 6
  - (b) Explain acceptance-rejection technique. 4
  - (c) Write an algorithm to generate stationary AR (1) time series model. 3

Con. 2470-12.

**SV-1016**

(3 Hours)

**[Total Marks: 75**

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**Section I**

1. (a) Define a data warehouse. Differentiate between operational database and data warehouse. **5**
- (b) Write a short note on information system. **5**
- (c) Explain physical and operational infrastructure related to data warehouse. **3**
2. (a) Write short note on data granularity. **5**
- (b) Following is the fact-less fact table for a store chain application: **5**  
 Transaction( date\_key, product\_key, sales\_key, store\_key, grossProfit)  
 Draw a cube containing entities with four dimensions and locate dimension tables. Depict the relation between fact-less fact table and dimension tables using star schema.
- (c) Explain how to form information package by considering a scenario of toy shop. **3**
3. (a) Explain how kD tree is constructed using set of nodes  $\{(2, 2), (6, 7), (3, 8)\}$  by taking (7, 4) as a root. **5**
- (b) What is a rule-based classification? Explain with example mutually exclusive and exhaustive rules. Explain how PRISM classifier improves the performance over 1R classifier? What do you understand by RIPPER? **5**
- (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**
4. (a) What is a cluster Analysis? Differentiate between partition and hierarchical clustering. **5**
- (b) The daily expenditures on food ( $X_1$ ) and clothing ( $X_2$ ) of five persons are shown 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 with dendrogram.

- (c) Explain CLARA algorithm. **2**
5. (a) Define support and confidence to measure the strength of an association rule. Calculate support and confidence for the association rule  $A \rightarrow C$  for the following: **5**

TID	Items
1	{A,B,C}
2	{A, C}
3	{A, D}
4	{B, E, F}

- (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
A	{ Biscuits, Milk}
B	{ Biscuits, Flowers, Apples, Oranges}
C	{ Milk, Flowers, Apples, Pepsi}
D	{ Biscuits, Milk, Flowers, Apples}
E	{Biscuits, Milk, Flowers, Pepsi}

- (c) Explain market basket analysis concept. Support your answer with example. **2**

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## SECTION II

6. (a) Define the terms speed-up and scale-up. What is the importance of linearity in speed-up and scale-up? 5  
 (b) What do you understand by data partitioning? What are the different types of partitioning techniques? 5  
 (c) Describe and explain any two architectures supported by distributed DBMS. 2
7. (a) Explain distributed and transaction transparencies in distributed database. 5  
 (b) What is the intuition behind 3PC? What are its pros and cons relative to 2PC? 5  
 (c) When can you say that the global history is serializable? 2
8. (a) Compare RDBMS with ODBMS. Describe an application scenario for which you would choose a RDBMS and explain the reason for choosing it. Similarly, describe an application scenario for which you would choose an ODBMS and again explain why you have chosen it. 5  
 (b) Differentiate between object identity and primary key. 5  
 (c) Using relational schema  $\text{product}(\text{Pno}, \text{Pname}, \text{price})$ , and explain the difference between message and method. 3
9. (a) Explain different process to store XML data into database. 5  
 (b) Write a short note on semi structure data model. 5  
 (c) Consider the following IDB predicate: 3  

$$p(X, Y) : -q(X, Z) \& r(Z, Y) \& Y < 10$$
 Evaluate the above datalog program by taking  
 $Q = \{(1, 2), (3, 4)\}$  and  $R = \{(2, 5), (4, 9), (4, 10), (6, 7)\}$ .
10. (a) Is time an important attribute in temporal database? Differentiate between valid and transaction time by giving suitable relations. 5  
 (b) Consider the schema called Contact Numbers from your cellular phone. Identify spatial and non-spatial data items. How do you distinguish between spatial and non-spatial queries? 5  
 (c) How does mobile DBMS different from a traditional DBMS? 3