

M.SC. (COMPUTER SCIENCE) (PART-I)
Principles of Compiler Design

(DEC - 2018)

(3 hours)

Q.P. Code: 23356

[Total Marks: 75]

- N. B.:** (1) Attempt any **three** questions from **each section**.
 (2) **Figures** to the right indicate full marks.
 (3) Assume additional data if necessary but state the same clearly.
 (4) Symbols have their usual meanings and tables have their usual standard design unless stated otherwise.

Section I

- 1 a. Write a note on Lexical Analysis and syntax analysis of a compiler 05
 b. List and explain various data elements used in a programming languages. 05
 Explain assignment and decision making statements used by procedural language. 03
- 2 a. Explain the concept of regular expression and write regular expression for accepting a string over {a,b,c} starting with aa middle bb and ending with cc. 05
 b. Write a short note on DFA and NFA. 07
- 3 a. Compute First and Follow for the following grammars: 06
 1) $S \rightarrow aB|bA$
 $A \rightarrow bAA|aS|a$
 $B \rightarrow aBB|bS|b$
 2) $S \rightarrow 0A1|0A0$
 $A \rightarrow 0A0|1$
 3) $S \rightarrow A^*B|@A$
 $A \rightarrow @B|B^*$
 $B \rightarrow @A|^*$
 b. List various drawbacks of implementing top down parsing with backtracking. 03
 c. Write a note on Lex. 03
- 4 a. Use following production rules and derive the mentioned string. Also draw parse tree. 06
 [use leftmost derivation]
 $E \rightarrow E+E$ $E \rightarrow E^*E$ $E \rightarrow (E)$ $E \rightarrow id$
 String = id*id+id
 b. Discuss RDP with suitable example. 06
- 5 a. Check whether following Grammar is in SLR (1) or not? 06
 $S' \rightarrow S$
 $S \rightarrow L = R$ $S \rightarrow R$
 $L \rightarrow *R$ $L \rightarrow id$ $R \rightarrow L$

- 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

- 6 a. What is a syntax direct translation? Explain its types with suitable examples. 04
- b. What is the need of NEWTEMP() in syntax directed translation? Explain with example. 04
- c. Write an algorithm for converting infix to postfix. 04
- 7 a. Explain the concept of self-organizing list with respect to symbol table. 04
- b. Discuss the memory organization for a C program. 04
- c. Write a note on syntax errors along with suitable examples. 04
- 8 a. Define following: 05
- 1) Ud-chaining
 - 2) Live variable
 - 3) Constant folding
 - 4) Induction variable
- b. State the need of DAG and explain the concept with suitable example. 04
- c. Write the properties of DOM. 04
- 9 a. Define IN[n] and OUT[n]. 03
- b. What is directed acyclic graph(DAG)? Explain algorithm for constructing DAG. 05
- c. Explain loop unrolling and loop jamming techniques. 05
- 10 a. Explain the machine environment for a typical code generation phase of compiler. 06
- b. Write a note on peephole optimization. 06

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 (6) Use of **simple calculator** and **statistical tables** are **allowed**.

Section I

- 1 a. Determine the impulse response and frequency response of the filter define by **6**
 $y(n)=x(n)+x(n-1)+by(n-1)$
 b. What is twiddle factor? Find the IDFT of sequence with DFT **6**
 $[2, -1, 0, 3]$
- 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 $x(n)*h(n)$ **6**
 using overlap save method. Explain each step in detail.
- 3 a. Realize the system given by difference equation, **6**
 $y(n) = -0.1y(n-1) + 0.3y(n-2) + 0.5x(n) - 0.14x(n-2)$
 Use parallel form, Is this system stable? Determine its impulse response.
 b. Determine Direct form II realization for following LTI system **6**
 $2y(n) + y(n-1) - 4y(n-3) = x(n) + 3x(n-1)$
- 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 **6**
 systems.
- 5 a. What is the purpose of Bluestein's algorithm? How it is achieved? State the **6**
 major significance of Bluestein algorithm.
 b. Why Chirp z transform (CZT) is an efficient algorithm? Discuss operations in **6**
 CZT.

Section II

- 6 a. Explain two-dimensional digital filter design considerations using System **6**
 Transfer function.
 b. What is fan-in and fan-out? Design a system to determine largest of two-3 bit **7**
 numbers. Assume the number system deals with only positive numbers.
- 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. Explain Excitation network for voiced fricatives. 6
- b. Compare Radix 2 and Radix 4 Pipeline FFTs. 7

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Section I

1. A Write a short note on Hidden and Exposed Terminals. **06**
B How Signal Propagation works in Wireless Communication? **06**
2. A Write a short note on Digital Audio Broadcasting. **06**
B Explain GEO, LEO and MEO. **06**
3. A What are infrastructure and ad-hoc networks? Explain them with architectural diagram of IEEE 802.11. **06**
B Explain advantages of WLAN. **06**
4. A Write a short note on Agent discovery. **06**
B Explain Flat ad-hoc routing. **06**
5. A Write a Short note on Digital Video Broadcasting. **06**
B Explain Traditional TCP. **06**

Section II

6. A State the advantages and disadvantages of Simulation. **06**
B A pair of unbiased dice is rolled once. Find the probability distribution of the sum of the two numbers occurring on the uppermost face of the dice. Also find the cumulative distribution function. **07**
7. A Explain Weibull Distributions with its three parameters. **06**
B Explain the Kolmogorov-Smirnov test to test the uniformity of a set of numbers. **07**
8. A Explain the terms with respect to Queuing Systems: **06**
1) Service Times 2) Service Mechanism.
B Write an algorithm to generate EAR(1) Time Series. **07**
9. A Write an algorithm to generate a sequence of 2 digit random numbers using Linear Congruential method. Also generate random numbers between 0 and 1. $X_0=27, a=17, c=43$ and $m=100$. **06**
B Discuss AR(1) time series model. **07**
10. A Explain three steps of Model building with diagram. **06**
B Discuss Input-Output Validation during Turing test. **07**

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Section I

1. A Explain Top Down and Bottom Up approach of developing Data Warehousing. **06**
B Define Granularity. State Benefits of Granularity. Explain why Granularity is a major issue in Data Warehousing. **06**
2. A Write a short note on Snowflakes Schema. **06**
B Explain the importance and purpose of User training and support. Explain the factors based on which training can be provided? **06**
3. A Explain in detail Precision and Recall. **06**
B Briefly explain K Nearest Neighbor Technique of classification. **06**
4. A Write in details why preprocessing of data requires before applying Data Mining on the data. **06**
B What are outliers? State importance of Outliers. Also State some Application Areas of the same. **06**
5. A What is Association Rule? Define Support and confidence and explain with suitable example. **06**
B Explain in brief Web Usage Mining Issues. **06**

Section II

6. A Explain multi-client / single server and multi-client / multi servers distributed DBMS architecture. **06**
B Compare and contrast Distributed and Parallel database. **07**
7. A Explain different types of failures in reliability theory of distributed database. **06**
B State and explain following efficiency issues related to Query optimization. **07**
 - a. User defined aggregation.
 - b. Security method
8. A What is the difference between data-centric and document centric XML Document. **06**
B What are transient and persistent objects? Explain which one is better to use when. **07**
9. A Explain in what conditions Parallelizing individual operations can be performed? **06**
B Write a short note on: "Querying XML data." **07**
10. A What is Spatial Databases? How they are different than GIS? **06**
B What is the difference between: **07**
 - i. Linear and branching time and
 - ii. Discrete and continues time in temporal database