# M.Sc. (Computer Science) Part – I

## Principles of Complier Design I
## & Principles of Complier Design II

## April: - 2016

**QP Code : 18456**

**[Total Marks : 75**

Instructions:

1) Attempt **any three questions** from each section.
2) Figures to right indicate marks.
3) Assume suitable data if not specified. Mentioned it clearly.

**Section I**

Q.1

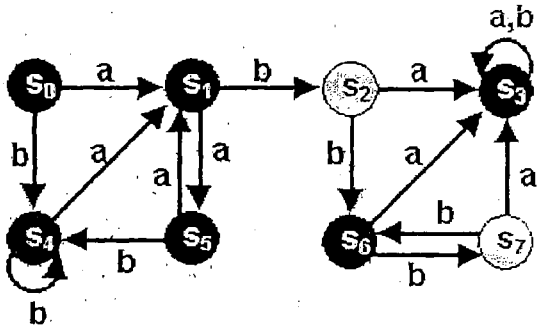
(a) List various operators used in Programming language. 04

(b) What is a cross compiler? Explain the uses. 04

(C) List various types of statements used in high level language. 04

Q.2

(a) 04




Minimize the above DFA. Start state is S0 and final state ={ S2 and S7 }

(b) Explain row major form and column major form of an array. 04

(c) Write a note on lex with respect to following points: 04

Concept, syntax and example.

Q.3

(a) Compute first() and follow() 04

1) S -> aZ/bA
   A-> bAA/aS/a

   Z-> aZZ/bS/b

2) S -> 2A3/2A2
   A->2A2/3

**[TURN OVER**

(b) Consider the following grammar and input string. Parse the string using shift reduce parser. Show the content of stack , input and action taken. 04

S- > S+C/B

B -> B&C/C

C->*C/a/b

String = *a&*b

(b) Develop CFG for strings accepting $a^N b^N$ where N > 1 04

Q.4

(a) Consider the following grammar and develop operator precedence table and parse string "i+i*i" 04

S- >S+S

S -> S*S

S -> i

(b) Construct a predictive parsing table for the following: 04

S->BC/AB

A->aAa/b

B->bAa/ε

C->ε

(c) When the grammar is said to be in LL(1)? Give suitable example. 04

Q.5

(a) Check whether following Grammar is in SLR (1) or not? 06

S→CC

C→cC/d

[TURN OVER

(b) Construct the parsing table and productions for LR parser moves below 06

0

0(4

0(4a5

0(4F3

0(4T2

0(4T2*7

0(4T2*7a5

0(4T2*7F 10

0(4T2

0(4E8

0(4E8)11

0E1

What is the o/p of parser?

Section II

Q.6

(a) Write syntax direct translations for the following Grammar. The Production Rules are as follows: 05

S →E$
E →E+E
E →E*E
E →M
M< →M digit
M →digit

(b) Write an algorithm for converting infix to postfix. 04

(c) What is a syntax direct translation? Explain its types with suitable examples. 04

Q.7

(a) Discuss various operations that can be performed on symbol table. 05

(b) Suppose we have a hash table with 10 locations and we wish to enter names which are integers using hash function h(i)=I mod 10 , i.e. the remainder when I is divided by 10. Show links created in hash and storage tables if the first 10 primes 2, 3,5...29 are entered in that order. As you hash more primes into table do you expect them to distribute randomly among the ten links? Why?? Or why not?? 04

(c) Define the term error and explain how to report an errors ? What are the various ways of reporting errors to user? 04

Q.8

(a) Discuss elimination of common sub expression and dead code elimination techniques. 05

(b) Write translation rules for following: 04

```
Type →struct {fieldlist}
      | ptr
     |char
     | int
     | float
    | double
Fieldlist →fieldlist field ;
          | field
Field →type id | field {integer}]
```

(c) Write applications of DAG. 04

Q.9

(a) Briefly explain usage count. 03

(b) Explain loop jamming and loop unrolling. 05

(c) What is DAG and explain algorithm to construct DAG. 05

[TURN OVER

Q.10

| | | |
|---|---|---|
| (a) | List and explain different types of addressing modes. | 05 |
| (b) | Consider the following Three-Address code statements and write possible code sequence in assemble level language. [Assume suitable machine architecture ]<br>T=A+B<br>U=A+C<br>V=T-X<br>W=V-U | 04 |
| (c) | Explain the general environment for machine architecture. | 04 |

# M.Sc. (Computer Science) Part – I
## Digital Signal Processing I & Digital Signal Processing II
## April: - 2016

**QP Code : 18510**

(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. | For each impulse response listed below, determine the corresponding system is (i) causal (ii) stable<br>1. $h(n) = \cos(n\pi/2)$<br>2. $h(n) = 2^n u(n)$ | 6 |
| | b. | Determine direct form-II realization for following LTI system<br>$y(n) = x(n) + x(n-1) - 2x(n-2) - 4x(n-4)$ | 6 |
| 2 | a | Realize the system given by difference equation,<br>$y(n) = -0.2y(n-1) + 0.4y(n-2) + 0.6x(n) - 0.1x(n-2)$<br>Use parallel form, Is this system stable? Determine its impulse response. | 6 |
| | b | Consider second order LTI system. Discuss cascade form realization of FIR systems. | 6 |
| 3 | a. | Explain impulse invariant transformation technique for digitizing an analog filter. | 6 |
| | b. | Compare between impulse invariant and bilinear transformation for Elliptic filters. | 6 |
| 4 | a. | What is the purpose of Bluestein's algorithm? How it is achieved? State the major significance of Bluestein algorithm. | 6 |
| | b. | Explain construction of a sixteen-point DFT from four-point DFTs. How many four-point DFTs are required for this construction? | 6 |
| 5 | a. | Why Radix-2 FFT is better algorithm for calculating DFT of a discrete signal as compared to direct computation of DFT using formula. | 6 |
| | b. | Compare between fixed-point arithmetic and floating-point arithmetic. Find 2's compliment of 0.01101 | 6 |

**[TURN OVER**

Section II

| | | | |
|---|---|---|---|
| 6 | a. | Design an eight-bit parity tree by generating a logical one for even parity and a logical zero for odd parity. | 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 | Give a simple (5 x 4) add-shift multiplier. How this multiplier can be realized? | 6 |
| | b | Discuss implementation of FIR filter using Booth algorithm. | 7 |
| 8 | a. | Discuss quantization effects in FFT algorithms. | 6 |
| | b. | Discuss any two hardware considerations for Radix 2 Algorithms | 7 |
| 9 | a. | Explain Homomorphic Processing of speech. | 6 |
| | b. | Draw and explain block diagram of a modern RADAR system. | 7 |
| 10 | a. | What is parallel processing? How it can speed up FFT operation? | 6 |
| | b. | Explain digital realization of a running sum. | 7 |

# M.Sc. (Computer Science) Part – I
## Mobile Computing
## & Computer Simulation Modelling
## April: - 2016

**QP Code : 18563**

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 indicates full marks.

(4) Use of simple calculator is allowed.

(5) Abbreviations have their usual meanings unless stated otherwise.

Section I

Q. 1 (a) Explain whether directional antennas would be useful in mobile phones. How can the gain of the antenna be improved?

Describe packet reservation multiple access scheme along with the diagram. [6]

(b) Explain the different types of handover in GSM system with the help of a diagram. [6]

Q. 2. (a) How is localization, location update and roaming are done is GSM and reflected in the databases? What are typical roaming scenarios.

What are the different components of GPRS architecture reference model. Draw the diagram for the same. [6]

(b) What characteristics do the different satellite orbits have? What are their pros and cons. [6]

Q. 3 (a) What are infra red and radio transmission. Write their advantages and disadvantages.

Explain broadcast transmission and different broadcast patterns with the help of diagram. [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. [6

Q. 4 (a) Write note on IPv6 and dynamic host configuration protocol. [6]

(b) Explain Mobile ad-hoc networks with reference to routing. [6]

Q. 5 (a) Name reasons for the development of wireless ATM. What is one of the main differences to internet technologies from this point of view? Why did WATM not succeeded as stand alone technology, what parts of WATM succeeded.? [6]

(b) Define Snooping , indirect and mobile TCP protocol [6]

[TURN OVER

Section II

Q6. (a) Define Simulation. State the advantages of Simulation. (5)

(b) Able has a knee cap injury and cannot move as fast. Consequently two things happen. Able's service distribution changes and baker gets the first shot of the customer if both the carhops are idle. Able's service time distribution is as follows (Table 2) also bakers service time distribution is as follows (Table 3). The arrivals follow a distribution as shown in the table below (Table 1). Develop a simulation and subsequent analysis for 20 iterations. Calculate the following statistics. (8)

1. Average busy time of Able
2. Average busy time of Baker
3. Average wait time

| Table 1 | | Table 2 | | Table 3 | |
|---|---|---|---|---|---|
| Arrival Time | Probability | Service Time | Probability | Service Time | Probability |
| 1 | 0.25 | 1 | 0.30 | 1 | 0.35 |
| 2 | 0.40 | 2 | 0.30 | 2 | 0.25 |
| 3 | 0.20 | 3 | 0.25 | 3 | 0.20 |
| 4 | 0.15 | 4 | 0.15 | 4 | 0.20 |

Use the following random numbers:
Random nos for arrival:
94,77,49,45,43,32,49,00,16,24,31,14,41,61,85,08,15,97,52
Random nos for service:
80,20,15,88,98,65,86,73,24,60,78,29,01,90,93,73,21,45,76,96

Q7. (a) Explain Weibull distribution with its three parameters. (8)

(b) State and Explain the mean, variance and cdf of Uniform distribution. (5)

Q8. (a) Briefly explain the autocorrelation test for random numbers. (5)

(b) Explain the following terms with respect to Queueing Systems: (4)
(i) System Capacity (ii) Arrival Process

(c) 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 X0 = 37, a = 7, c = 29 and m = 100. (4)

Q9. (a) Explain procedure of generating random variables by inverse transformation for Continous Uniform distribution. Also generate three random variables for Uniform Distribution for the given parameter values a = 2 and b = 5 using the following Random numbers : 0.19, 0.29 and 0.94. (5)

(b) Test whether the 3rd, 8th, 13th and so on, numbers in the following sequence are auto correlated. Use $\alpha = 0.05$ and table value = 1.96. (8)
Observations: 0.12, 0.01, 0.23, 0.28, 0.89, 0.31, 0.64, 0.28, 0.83, 0.93, 0.99, 0.15, 0.33, 0.35, 0.91, 0.41, 0.60, 0.27, 0.75, 0.88, 0.68, 0.49, 0.05, 0.43, 0.95, 0.58, 0.19, 0.36, 0.69, 0.87.

Q10. (a) Explain the Convolution method to generate random variates for an Erlang distribution. (5)

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

(c) Explain EAR(1) time series model. (4)

# M.Sc. (Computer Science) Part – I
## Data Warehousing and Mining & Advanced Database Systems
## April: - 2016

**QP Code : 18618**

( 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 **same answer book.**
(3) Figures to the right indicate full marks.
(4) Use of simple calculators is allowed.

**Section I**

1 a. Define a data warehouse. Differentiate between operational database and data warehouse. 6

b. Explain the steps involved in building a data warehouse. 6

2 a. Differentiate between star and snow flake schema used in data design. Give an example to support your answer. 6

b. What is the significance of the ETL process? What are different basic data transformations task performed in ETL process? 6

3 a. Consider the following weather report. Use Bayes rule and decide if there is a cricket play with outlook = sunny, temperature = cool, humidity = high, windy = true. 6

| 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 | | | | | | | | |

b. Consider the following table, where class L: low and H: high risk. Use ID3 algorithm to create a decision tree for classifying data. 6

| Age | Car type | Class |
|---|---|---|
| >21 | Maruti | L |
| >21 | Hyundai | H |
| <21 | Maruti | H |
| <21 | Indica | H |
| > 21 | Maruti | L |
| >21 | Hyundai | H |

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. 6

b. For the following construct a graph that shows all the edges corresponding to data and hence draw dendrogram. 6

| Item | 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 |

5 a. Define support and confidence to measure the strength of an association rule. Calculate support and confidence for the association rule A → C for the following: 6

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

b. Explain how to generate Frequent Pattern tree for the following data sets with minimum support 3: 6

| TID | Items bought |
|---|---|
| 101 | {y, x, z, p, q, r, s, e} |
| 102 | {x , f, z, y, g, s, h} |
| 103 | {f, y, m, n, h} |
| 104 | {f, z, o, a, b} |
| 105 | {x, y, z, t, g, b, s, u} |

## Section II

6. a. Define the terms speed-up and scale-up. What is the importance of linearity in speed-up and scale-up? 6

b. Write a short note on (i) Location transparency, (ii) Fragmentation transparency in distributed DBMS. 7

7. a. Explain with example dead locks in distributed database? 6

b. What is a commit protocol and why is it required in a distributed database? Explain how the system recovers from failure and deals with a particular transaction T in each of the following cases using 2-phase commit protocol: 7
(i) A subordinate site for T fails before receiving a prepare message.
(ii) A subordinate site for T fails after receiving a prepare message but before making a decision.

8. a. Compare RDBMS with ORDBMS. 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 ORDBMS and again explain why you have chosen it. 6

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. 7

9. a. What are the differences between structured, semi-structured and un- structured data in XML database? 6

b. What is a datalog program? Consider the Flights relation : 7

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.

10. a. Explain with example Event-Condition-Action rule in active database. 6

b. Is time an important attribute in temporal database? Differentiate between valid and transaction time by giving suitable relations. 7