Total No. of printed pages = 10

63/2 (SEM-3) CSIT 3·1 (A,B)

2022

THEORY OF COMPUTATION

(Theory Paper)

Paper Code : CSIT-3·1(A)

Full Marks – 80

Pass Marks – 32

Time – Three hours

The figures in the margin indicate full marks for the questions.

• **Instruction :**

This paper contains three sections : Section A, Section B and Section C. Section A contains 10 questions, each question carries 1 mark. In Section B out of 10 questions only 6 questions are compulsory, each question carries 5 marks. In Section C out of 6 questions only five questions are compulsory, each question carries 8 marks.

[Turn over

SECTION – A

- Answer the following questions : 1×10=10

1. Match the following columns :

Column – A	Column – B
(i) Type 0	(A) Regular Grammar
(ii) Type 1	(B) CFG
(iii) Type 2	(C) Context-Sensitive
(iv) Type 3	(D) Turing Machine

(a) (i)-(B), (ii)-(A), (iii)-(D), (iv)-(C)

(b) (i)-(D), (ii)-(A), (iii)-(A), (iv)-(C)

(c) (i)-(C), (ii)-(A), (iii)-(B), (iv)-(D)

(d) (i)-(D), (ii)-(C), (iii)-(B), (iv)-(A)

2. What is the Regular Expression Matching one or more specific characters ?

(i) x (ii) +

(iii) * (iv) &

3. Which of the following strings is not generated by the following grammar ?

$S \rightarrow SaSbS|\varepsilon$

(i) aabb (ii) abab

(iii) aababb (iv) aaabbb

4. Regular expression (x+y) + (x+y) denotes the set

(i) {xy,xy} (ii) {xx,xy,yx,yy}

(iii) {x,y} (iv) {x,y,xy}

5. Given grammar S–> (L) | a L –> L, S | S which of the input recognised by the grammar. Select one

(i) {(a, a), a} (ii) (a, a)

(iii) {(a, a, a), a} (iv) All of these

6. The grammar E–> E+E | E*E | a

(i) Ambiguous

(ii) Unambiguous

(iii) Depends on the given sentence

(iv) None of the above

7. The main difference between DFA and NDFA is

(i) In DFA from any given state there cannot be any alphabet leading to two different states.

(ii) In NDFA empty transition may be present.

(iii) In NDFA from any given state there cannot be any alphabet leading to two different states.

(iv) In DFA empty transition may be present.

8. The set {a, aa, aaaa, aaaaaa, ...} represents the regular expression

(i) a^* (ii) $(aa)^*$

(iii) aa^* (iv) None of these

9. A Mealy machine accepts a string w of length n. The length of the output string is

(i) $n+1$ (ii) $n-1$

(iii) n^2 (iv) n

10. The output of a Moore machine depends on

(i) the present state only

(ii) the present state and the input symbol

(iii) the input symbol only

(iv) None of the above.

SECTION – B

• Answer any *six* of the following questions : 5×6=30

1. Construct the following DFA :

(a) Construct a DFA for the set of string over {a, b, c} having ***bca*** as a substring.

(b) Construct a DFA for the set of string {a, b} ends in the substring ***ba***.

2. Construct the following Regular Expression :

(a) The set of all string over {a, b} containing at most 2a's.

(b) {000, 0001, 00011, 000111, ...}.

3. Construct a finite automation for the regular language $(ab+c^*)^*b$.

4. Define Mealy and Moore machine.

5. Construct a regular grammar G generating the regular set represented by $P = a^*(a+b)(a+b)^*$.

6. If G is the grammar $S \rightarrow SbS/a$, show that G is ambiguous.

7. If G be the grammar $S \rightarrow 0B/1A$, $A \rightarrow 0/0S/1AA$, $B \rightarrow 1/1S/0BB$. For the string ***00110101***, find **leftmost derivation.**

8. Discuss the model of PDA with ID.

9. Prove the following identities of regular expression :

   (a) $(PQ)^*P = P(QP)^*$

   (b) $\varepsilon + R = R + \varepsilon$.

10. Define Chomsky Classification of languages with example.

SECTION – C

- Answer any *five* of the following questions : $8 \times 5 = 40$

1. Construct a minimum state automation equivalent to the finite automata from the given transition table :

State/Σ	0	1
q_0	q_1	q_5
q_1	q_6	q_2
q_2^*	q_0	q_2
q_3	q_2	q_6
q_4	q_7	q_5
q_5	q_2	q_6
q_6	q_6	q_4
q_7	q_6	q_2

2. If L is regular then L^T is also regular.

3. Define Chomsky normal from (CNF).Find a grammar in CNF equivalent to

   $S \rightarrow aAbB,\ A \rightarrow aA/a,\ B \rightarrow bB/b.$

4. Construct a PDA accepting the language $L=\{a^n b^m c^n / m, n \geq 1\}$ by null store. Construct the corresponding Context-free grammar accepting the same set.

5. What is Pumping Lemma ? Show that the set $L=\{a^{i^2} / i \geq 1\}$ is not regular.

6. What are unit and null production ? Find the reduced grammar equivalent to the grammar $S \rightarrow aAa,\ A \rightarrow bBB,\ B \rightarrow ab,\ C \rightarrow aB$.

(Theory Paper)

Paper Code : CSIT-3·1(B)

(Web Programming and Technology)

Full Marks – 80

Pass Marks – 32

Time – Three hours

The figures in the margin indicate full marks for the questions.

1. Answer any *five* of the following questions : 1×5=5

(a) If you want to display some HTML data in a table in tabular format, which HTML tags will you use ?

(b) What is a 'Marquee' Tag in HTML ?

(c) How to write a hello world example of JavaScript ?

(d) What is the purpose of web browser ?

(e) What is Semantic HTML ?

2. Answer any *five* of the following questions : 2×5=10

(a) What is the key difference between HTML Elements and Tags ? Also, can you separate sections of texts in HTML ?

(b) How to create a function in JavaScript ?

(c) What is Virtual Hosting ?

(d) What is the primary function of the web browsers ?

(e) What are some of the common Cyber attacks ?

(f) Explain Phishing and how to prevent it ?

3. Answer any *five* of the following questions : 5×5=25

(a) What is Client/Server Computing ? Mention the characteristics of Client/Server Computing.

(b) Mention the classification of Client/Server architecture. Explain three-tier architecture.

(c) How web browser works ? Discuss with proper diagram of web browser architecture.

(d) Discuss the different types of cascading style sheet with examples.

(e) What is web server ? Discuss the working of web server.

(f) What is a Proxy Server and how do they protect the computer network ?

4. Answer any *three* of the following questions : 8×3=24

(a) Write an HTML program for creating web page containing tags namely hyperlink, marquee, table, dropdown, radio button, button etc.

(b) Write a JavaScript Program for calculator containing addition, subtraction, multiplication, division, clear etc.

(c) Explain the concept of a firewall. What are the various types of firewalls ? Explain in brief.

(d) What is CORBA ? Discuss the architecture of CORBA.

5. Write short notes on any *four* of the following: 4×4=16

(a) Client/Server : Fat or Thin

(b) HTTP

(c) SGML

(d) XML

(e) TELNET

(f) Domain Name System.