

2020

BCA

5th Semester Examination

ELECTIVE I

PAPER—3104

Full Marks : 100

Time : 3 Hours

The figures in the right-hand margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Illustrate the answers wherever necessary.

Web Design and Application

Group A

Answer any *three* questions.

20×3

1. (a) What is a website? Explain the steps for developing website with a suitable example.

(b) What is a CSS? Explain different types of CSS.

(3+7)+(2+8)

(Turn Over)

2. (a) What do you mean by ISP? Discuss how information travels through an ISP.
- (b) What is DNS? State the application and working procedure of DNS. (4+6)+(2+8)
3. (a) Write and explain any five features of modern Browsers.
- (b) What is a Javascript? What help does DOM provide to Javascript? Write a Javascript to add two numbers. 10+(2+3+5)
4. (a) What is Internet? Discuss the evaluation and applications of the internet.
- (b) What is a Search Engine? Discuss few techniques to improve search rank. How web services are accessed in a webpage? (2+5)+(2+5+6)
5. (a) What is a session? What advantages do you have with session? Is session a secure object?
- (b) What is XML? Differentiate XML schema with DTD.
- (c) What are the rules for creating XML documents? (3+4+2)+(2+4)+5
6. (a) Differentiate between (any two) :
- (i) tags and attribute
 - (ii) cellpadding and cellspacing
 - (iii) Marquee and Frame.

- (b) Develop a simple web page that asks the users input name, email, phone, and gender.
- (c) What is a list? Explain different types of lists in HTML with example. $(2 \times 4) + 6 + (2 + 4)$
7. (a) Give the difference between essential tags and deprecated tags.
- (b) Explain the following HTML tags
- (i) pre
 - (ii) a
 - (iii) img
 - (iv) font
- (c) State the difference between client side and server side programming? Give example of each. $4 + (4 \times 2) + 8$

Group B

Answer any one question. 10×1

8. Define the following protocols: IP, TCP, FTP, HTTP, and SOAP. 10
9. What is web publishing? What is required to publish web contents? Explain two web publishing tools. 2+3+5
10. Explain the following using CSS giving appropriate code: (any two)
- (i) text alignment ;

- (ii) indentation
- (iii) decoration
- (iv) spacing
- (v) transformation 5×2

[Internal Assessment: 30]

Fuzzy Logic and Neural Network

Group A

Answer any *three* questions. 20×3

1. What do you mean by learning of neural networks? Discuss different types of learning algorithm along with their limitations. 4+16
2. What is Fuzzy centroid defuzzification scheme? Explain how is it used in FAM system architecture? 5+15
3. State the fuzzy entropy theorem and explain it with suitable example. 8+12
4. Briefly discuss the different architectures of neural network. 20
5. State and prove perceptron convergence theorem and also discuss the various applications of perceptron model. 12+8

6. With the help of suitable example describe Max-Min fuzzy composition. 20
7. Write short notes on : 5×4
- (i) Hopfield Model.
 - (ii) Fuzzy Cognitive Maps.
 - (iii) Design of OR gate using neural network.
 - (iv) Stochastic Equilibrium

Group B

Answer any one question. 10×1

8. Differentiate between SOM and ESOM.
9. What do you mean by membership function? Discuss the different membership function of fuzzy. 5+5
10. What is Recurrent neural network? Why is the context layer important in Simple Recurrent Networks? 5+5

[Internal Assessment: 30]

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Automata Theory

Group A

Answer any *three* questions.

20×3

1. (a) Construct a DFA equivalent to an NFA whose transition table is defined below :

State	Input = 0	Input = 1
q0	q1, q3	q3, q3
q1	q1	q3
q2	q3	q2
q3	--	--

(q0 is the initial and q3 is the final state.)

- (b) Construct a DFA accepting all strings w over $\{a, b\}$ such that the number of a 's in w is divisible by 3.
- (c) Prove that CFLs are not closed under intersection and complement operation. 7+7+6
2. (a) Classify grammars according to Chomsky. Define each of them with suitable examples.
- (b) Find a grammar generating $L = \{anbcj \mid n \geq 1, j \geq 0\}$.

(c) Prove that a context-sensitive language is recursive.

8+5+7

3. (a) Design a PDA which accepts $L = \{anb2n | n \geq 1\}$.

(b) Construct an equivalent PDA for the following CFG.

$S \rightarrow aAB/bBA$

$A \rightarrow bS/a$

$B \rightarrow aS/b$

Check if the string a^3b^3 is accepted by the PDA or not.

10+10

4. (a) Convert the following grammar into GNF :

$S \rightarrow AA|a$

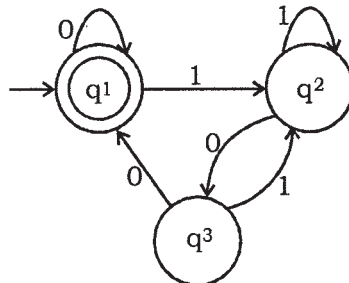
$A \rightarrow SS|b$

(b) What do you mean by regular expression? List some identities of regular expression. Construct a regular grammar G generating the regular set represented by:

$P = (a+b)^*ab^*a(a+ab+ba)$

10+(2+3+5)

5. (a) Find the R.E. accepted by the finite automaton whose transition diagram is as shown below.



- (b) Show that $L = \{ap \mid p \text{ is a prime}\}$ is not regular. 10+10
6. (a) Construct a reduced grammar equivalent to the grammar :
- $$S \rightarrow aAa$$
- $$A \rightarrow Sb \mid bCC \mid DaA$$
- $$C \rightarrow ab \mid DD$$
- $$E \rightarrow aC$$
- $$D \rightarrow aDA$$
- (b) Reduce the following grammar into CNF :
- $$S \rightarrow a \mid b \mid cSA$$
- $$A \rightarrow aA \mid a$$
- 10+10
7. (a) What do you mean by PDA? Briefly describe the working mechanism of PDA.
- (b) Differentiate between top-down and bottom-up parsing.
- (c) Design a TM that copies strings of 1's. (2+4)+4+10

Group B

Answer any *one* question. 10×1

8. If $ACFG = \{(G, w) \mid \text{the context-free grammar } G \text{ accepts the input string } w\}$, then prove that $ACFG$ is decidable.
9. State and prove Arden's theorem for regular expressions.

10. Write short notes : 5×2
- (i) Universal Turing machine.
 - (ii) LR(1) grammar.

[Internal Assessment: 30]

Compiler Design

Group-A

Answer any *one* question. 10×1

1. (a) Find the FIRST and FOLLOW of the following grammar
- $$S \rightarrow ACB/CbB/Ba$$
- $$A \rightarrow da/BC$$
- $$B \rightarrow g/\varepsilon$$
- $$C \rightarrow h/\varepsilon$$
- (b) "No left recursive grammar can be LL(1)" - Explain with example. 5+5
2. (a) Consider the grammar
- $$S \rightarrow aAB/bA/\varepsilon$$
- $$A \rightarrow aAb/bAa/\varepsilon$$
- $$B \rightarrow bBa/aBb/\varepsilon$$
- Frame the transition table.

(b) Consider the following grammar

$$S \rightarrow A$$

$$A \rightarrow B/BaA$$

$$B \rightarrow bC$$

$$C \rightarrow Cb/Cc/\varepsilon$$

The above is not LR (0). Why?

5+5

3. (a) Construct GOTO graph of :

$$S' \rightarrow S$$

$$S \rightarrow cC$$

$$S \rightarrow cC/d$$

(b) Eliminate left recursion in the following grammar

$$S \rightarrow Sab/SaS/X$$

$$X \rightarrow Xc/a/b$$

5+5

Group-B

Answer any *three* questions.

20×3

4. Consider the following grammar :

$$S \rightarrow Aa/Bb/cC$$

$$C \rightarrow Ab/Ba$$

$$A \rightarrow D$$

$$B \rightarrow D$$

$$D \rightarrow \varepsilon$$

Construct the LL(1) parse table for this grammar. Is the grammar LL(1)? Why or why not?

5. Consider the following grammar

$$A \rightarrow aCDq/aBg/\varepsilon$$

$$D \rightarrow d/\varepsilon$$

$$B \rightarrow e/\varepsilon$$

$$C \rightarrow Ct/p/\varepsilon/BD/rAb$$

Demonstrate that the grammar is LR(0) or not.

6. Given a grammar with the following rules :

$$S \rightarrow A\#$$

$$A \rightarrow bB$$

$$B \rightarrow cC$$

$$B \rightarrow cCe$$

$$C \rightarrow dA$$

$$A \rightarrow a$$

Is the grammar LR(1)? If not, why?

7. Consider the following grammar:

$$E \rightarrow E+T|T$$

$$T \rightarrow TF|F$$

$$F \rightarrow F^*|a|b$$

Construct the SLR parsing table and also parse the input "a*b+a".

8. Write short note on :

5×4

(a) Three address code

(b) Syntax Tree

- (c) Symbol Table
(d) Finite Automata
9. Construct LALR parsing table for
 $S \rightarrow S$
 $S \rightarrow aAd/bBd/aBc/bAc$
10. Design a DFA which accepts even no of a's over the alphabet $\{a,b\}$. Explain the limitation of Finite Automata. State and Prove Arden's Theorem. 5+5+10

[Internal Assessment: 30]

Mobile Computing

Group A

Answer any *three* questions. 20×3

1. Explain various applications of Mobile Computing. Discuss MAC layer Bluetooth system. Compare between GSM and CDMA. 7+7+6
2. How UMTs networks are different from 2G network? Describe the function of HLR and VLR. Briefly explain the mobile TCP. 6+6+8

3. What is GPRS system? What is mobile IP? Briefly explain the layers of mobile IP. Explain, why Tunneling procedure is used?
5+3+6+6
4. State the difference between 1G, 2G, 3G and 4G. 20
5. Briefly explain the working procedure of FDMA, TDMA and CDMA.
20
6. What is hand-off technique? What do you mean by MAC? Differentiate between soft and hard handover. Define Bluetooth.
4+4+8+4
7. What do you mean by snooping? What is adhoc network? Briefly explain how the mobile cellular communication has evolved over different generation of technology.
5+5+10

Group B

Answer any one question. 10×1

8. Explain the operation of mobile IP with the help of a suitable example and a schematic diagram.
9. Briefly explain the detailed steps that are being carried when a communication is made between mobile to mobile.
10. Write short notes on any *two* : 5×2
 - (a) WAP
 - (b) IEEE 802.11

- (c) Modulation
- (d) MANET

[Internal Assessment: 30]

UNIX and Shell Programming

Group A

Answer any *three* questions. 20×3

1. (a) What is UNIX? Explain the architecture of UNIX OS.
(b) Write features of UNIX Operating System.
(c) What are Absolute and Relative Path? Explain with example.
(d) Explain Links and Symbolic Links in UNIX.
(1+5)+4+(3+3)+(2+2)

2. (a) What is Inter Process Communication?
(b) Describe the following methods in IPC :
 - (i) Pipes
 - (ii) Semaphores
 - (iii) Shared memory

(iv) Sockets

(v) Signals

(c) Why PID and PPID are used in UNIX ?

(d) What do the following UNIX system variables signify ?

(i) LANG

(ii) HOME [2+(2×5)+(2+2)+(2+2)]

3. (a) What is Shell in UNIX ?

(b) Write a Shell Script which receives any year from keyboard and determines whether the year is Leap year or not. If no argument is supplied, the current year should be assumed.

(c) Write a Shell program to generate Fibonacci Series upto n terms.

(d) Write a Shell script to reverse an integer. 2+6+6+6

4. (a) What are the duties of the following Commands :

i) chmod ii) chown and iii) chgrp

(b) What do you understand by System Call in UNIX ?

(c) Explain various Path names those are used in UNIX.

(d) Write differences between Shared memory model and Message passing model.

- (e) Explain Mount and Unmount Command.
(2+2+2)+2+4+4+(2+2)
- 5.** (a) Write a Shell script to determine if an integer is Prime or not.
- (b) Write differences between Line Editor and Screen Editor.
- (c) What are Internal and External Commands in UNIX?
- (d) Enlist the key features of Korn Shell.
- (e) What do you know about 'tee' Command? 6+4+(2+2)+4+2
- 6.** (a) Write advantages and disadvantages of Buffer Cache.
- (b) What do you understand by UNIX System Administrator? Write its functions.
- (c) Differentiate (i) cat Command and more Command
(ii) CMP Command and DIFF Command.
- (d) Explain File System in UNIX.
- (e) What do you know about inode in UNIX? 4+5+(2+2)+4+3
- 7.** Write short notes on any *four* of the following topics :
- (i) Environment Variables
- (ii) IFS
- (iii) Wild Card Characters

- (iv) Redirection
(v) Positional Parameters in UNIX 5+5+5+5

Group B

Answer any *one* question. 10×1

- 8.** (a) What is filter in UNIX?
(b) What is Zombie State?
(c) Explain 'nohup' in UNIX.
(d) What is the purpose of 'echo' Command?
(e) Explain the alias mechanism. 2+2+2+2+2
- 9.** (a) Write down some common Shells with their indicators.
(b) Explain System Bootup in UNIX.
(c) Write Commands (i) to make a new directory in UNIX
(ii) to remove files in UNIX.
(d) Write key features of Bourne Shell.
(e) What is Super User? 2+2+2+2+2

- 10.** (a) Write Commands which are used to perform system shutdown in UNIX.
- (b) What do you understand by region in UNIX ?
- (c) What do you understand by Vi editor in UNIX OS ?
- (d) Define Command mode and Insert mode of Vi editor.
- (e) What do you understand by 'root directory' ?
- 2+2+2+2+2

[Internal Assessment: 30]

APPLIED GRAPH THEORY

Group A

Answer any *three* questions. 20×3

- 1.** Give the proof for the following theorems :
- (a) Every tree has either one or two centers.
- (b) A graph is a tree if and only if it is minimally connected.
- Explain isomorphism between graphs. 8+6+6
- 2.** (a) Prove that the ring sum of two cut sets is either a third cut set or an edge disjoint union of two cut sets.

(b) Number of pendent vertices in a binary tree is $(n+1)/2$.

(c) Define a complete graph. 10+5+5

3. Show that a Hamiltonian path is a spanning tree.

Explain isomorphism between graphs.

Show that the complement of a bipartite graph need not to be a bipartite.

Explain Component of a Euler graph. 4+5+6+5

4. Describe the following with an example a) Sub-graph b) Spanning Sub-graph.

Give the proof for the following theorem i) If a graph has exactly two vertices of odd degree, there must be a path joining these two vertices.

Define the cut set of a graph. 5+5+6+4

5. A connected graph is an Euler graph if and only if every vertex has even degree. Show that the complete graph of 4 vertices is self-dual. Define Bipartite graph. 8+8+4

6. (a) Prove that a simple graph with n vertices and k components cannot have more than $(n-k)(n-k+1)/2$ edges.

(b) Give the proof for the following theorem :

If a graph has exactly two vertices of odd degree, there must be a path joining these two vertices.

(c) Discuss planar graph with one example. 8+8+4

7. (a) Define Hamilton cycle.
- (b) Explain eccentricity of a graph.
- (c) How many edge-disjoint Hamilton cycles exist in the complete graph with seven vertices? Also, Design the graph to show these Hamilton cycles. 4+4+(6+6)

Group B

Answer any *one* question. 10×1

8. Give the proof of the following theorem
 A spanning tree T of a given weighted connected graph G is a shortest spanning tree of G if and only if there exists no other spanning tree at a distance of one from T whose weight is smaller than that of T . 10
9. Write an algorithm to find the shortest path from a given source vertex to any vertex in a graph with an example. 10
10. Explain the proof of following theorem.
 The largest number of edges in a planar graph is $3n - 6$, where n is the number of vertices in the graph.
 Define a spanning tree in a graph. 8+2

[*Internal Assessment: 30*]

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