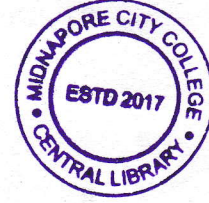# 2023

BCA 5th Semester Examination

ELECTIVE—I

PAPER — 3104

Full Marks : 70

Time : 3 hours

The figures in the right-hand margin indicate marks.

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

Illustrate the answers wherever necessary.

(Applied Graph Theory)

Answer from **both** the Groups as directed.

GROUP—A

Answer *any* **five** questions :   2×5=10

1. What is distance of a tree?

2. Define branch and cord.

3. Define cut sets with example.

(2)

4. Explain region of a graph.

5. What is regular graph?

6. Define Hamiltonian cycle.

7. Explain eccentricity of a graph.

8. Define multigraph with example.

GROUP—B

Answer any four questions.

9. (a) Show that a Hamiltonian path is a spanning tree.

(b) Explain isomorphism between graphs.

(c) Show that the complement of a bipartite graph need not be a bipartite.

(d) Explain components of graph.

4+5+4+2=15

10. (a) Describe the following with example :

(i) Sub-graph

(ii) Spanning sub-graph

(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) Define the cut set of a graph. 6+6+3=15

(Continued)

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(3)

11. (a) A connected graph is an Euler graph if and only if every vertex has even degree.

(b) Show that the complete graph of 4 vertices is self-dual.

(c) Define Walk.

6+5+4=15

12. (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 :

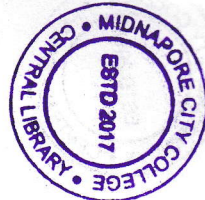If a graph has exactly two vertices of odd degree, there must be a path joining these two vertices.

(c) Discuss planar graph with one example.

6+5+4=15

13. (a) Consider the following graph :
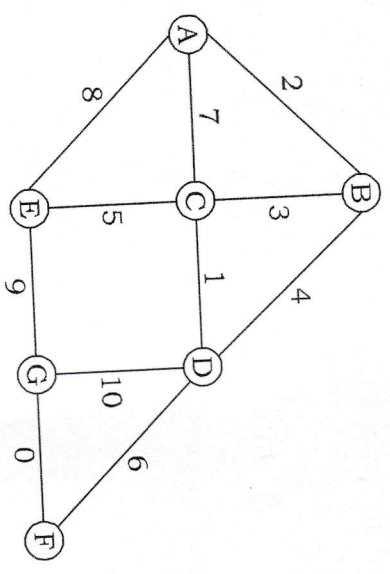
(Turn Over)

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(4)

What happens if we run Prim's algorithm starting on node A?

(b) What are the final costs and edges selected? Give the set of edges in the resulting MST.

(c) Define Prim's Algorithm for MST.

5+5+5=15

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(Continued)

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(5)

(*Web Design & Application*)

Answer Q. No. **1** and *any* **four** from the rest.

1. Answer *any* **five** questions :

2×5=10

(a) Explain GET and POST request methods.

(b) Define Anchor tag with an example.

(c) What is the use of $ symbol in PHP? Explain with an example.

(d) What are the differences between Generic Servlet and HTTP Servlet?

(e) What are the different types of session tracking mechanism suported by Servlets?

(f) What are PHP functions? Explain how to create and call functions.

(g) What is an ID selector in CSS?

(h) What is the use of <img> tag? Give the syntax of <img> tag.

2. Write short notes on the following :

5×3=15

(a) MIME

(Turn Over)

(6)

(b) WWW

(c) DNS

3. (a) Explain various datatypes used in JavaScript.

(b) Write a JavaScript code to find factorial of a number.

(c) Write a JavaScript code to check the contents entered in a form text element. If the text entered in the lower case, convert to upper case.   5+5+5=15

4. (a) List the statements that are used to connect PHP with MySQL with an example.

(b) Define Session and Cookies. Explain with an example program.   8+7=15

5. (a) Explain the structure of HTML web page with an example.

(b) Define Table tag and its attributes with an example.   7+8=15

6. (a) What is CSS? What are the advantages and disadvantages of using CSS in XHTML?

(Continued)

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(7)

(b) What is selector class? Explain any five types of selectors in CSS.   (2+6)+(2+5)=15

7. (a) Explain the several ways for positioning elements on the web pages.

(b) Design a PHP code to swap any two numbers.

(c) Write a PHP script for uploading a file to the server.   5+5+5=15

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(Turn Over)

(Fuzzy Logic and Neural Network)

Answer *any* **five** questions.

1. (a) Differentiate between Artificial Neural Network and Biological Neural Network.

   (b) What do you mean by cost estimation function in Neural Network?

   (c) Derive the decision line of AND gate using perception rule.

   $$4+3+7=14$$

2. (a) What are fuzzy propositions?

   (b) Derive cardinality and relative cardinality of a fuzzy set.

   (c) Define fuzzy singleton rule.

   (d) Differentiate between Classical sets and Fuzzy sets.

   (e) Define alpha cut, strong alpha cut sets and level sets of a given fuzzy set.

   $$2+3+2+4+3=14$$

3. (a) Explain in detail the architecture of McCulloch-Pitts neuron model and also realize 3-input EX-OR gate using the above neuron model.

   (b) Explain Hopfield network with diagram.

   (c) List different activation functions used in neural network.

   $$(3+2)+5+4=14$$

4. (a) Explain the following components of Fuzzy logic system :

   (i) Fuzzification

   (ii) Fuzzy rule base

   (iii) Fuzzy inference engine

   (iv) Defuzzification

   (b) Explain the steps involved in training algorithm of back propagation algorithm.

   $$(2\times4)+6=14$$

5. (a) Consider two Fuzzy sets A and B with their membership functions :

   $$\mu A(x)=\{0\cdot5,\ 0\cdot7,\ 0\cdot6,\ 0\cdot2,\ 0\cdot5\}$$

   $$\mu B(x)=\{0\cdot7,\ 0\cdot5,\ 0\cdot9,\ 0\cdot8,\ 0\cdot3\}$$

   Then compute –

   (i) $A \cup B$

(10)

(ii) $A \cap B$

(iii) $A' - B$

(iv) $A \cap B'$

(b) Discuss the effect of learning rule coefficient.

(c) Compare single layer and multilayer perception models. $(2 \times 4)+3+3=14$

6. Write short notes on (*any three*) : 14

(a) Kohonen's self-organizing map

(b) Fuzzy Controller

(c) BAM

(d) Hebb rule and Delta learning rule

(e) Adaptive Resonance Theory (ART)

7. (a) Using max-min composition and max-product composition, find the relation R(x,y) of given- $R(x,y) = \begin{bmatrix} 0.5 & 0.7 & 0.3 \\ 0.9 & 0.4 & 0.2 \\ 0.8 & 0.4 & 0.7 \end{bmatrix}$ and

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(Continued)

(11)

$R(y,z) = \begin{bmatrix} 0.3 & 1 \\ 0.4 & 0.2 \\ 0.3 & 0.6 \end{bmatrix}$.

(b) Explain the architectural details of an algorithm of MADALINE model. $7+7=14$

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(Turn Over)

(12)

(*Advanced Unix and Shell Programming*)

Answer from **both** the Groups as directed.

GROUP—A

Answer *any* **five** questions : 2×5=10

1. What do you mean by monolithic kernel?

2. Differentiate between $* and $@.

3. Mention two external commands of Unix with example.

4. What is the role of IFS system variable?

5. What do you mean by shell scripting?

6. What are the functions of 'rm' and 'rmdir' commands?

7. What are the different types of shells in Unix?

8. What do you know about Superuser in UNIX?

GROUP—B

Answer *any* **four** questions.

9. What are the different types of blocks on a disk in Unix? Explain each with functionality. What are the UNIX file attributes? 10+5=15

/751 *(Continued)*

(13)

10. What are the four stages of a Linux Process? What is Crontab? Explain with example. What are the advantages and disadvantages of shell scripting? 6+4+5=15

11. What do you mean by UNIX process life cycle? Explain with diagram. What is the significance of the environment variable given as HOME and PATH? 10+5=15

12. How many types of control instructions are available in a shell? Explain with example. Write down the functions of the following metacharacters : 7+8=15

>, *, [], ?, &, cmd, /, and \

13. (*a*) Explain the architecture of UNIX OS.

    (*b*) Write the features of UNIX Operating System.

    (*c*) Write the differences between line editor and screen editor. 5+5+5=15

14. (*a*) Write a shell script to determine if an integer is Prime or not.

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

    (*c*) What do you know about (*i*) tee command and (*ii*) cat command? 5+5+(2·5×2)=15

/751 *(Turn Over)*

(14)

15. Write short notes on (*any* **three**) : 5×3=15

   (*i*) Mounting and unmounting

   (*ii*) Grep commands

  (*iii*) 'sed' command and 'awk' command

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(15)

(*Mobile Computing*)

Answer *any* **five** questions.

**1.** (*a*) Show with a diagram, the steps in mobile terminated call in GSM.

   (*b*) Differentiate between FDMA and TDMA.

                                   8+6=14

2. (*a*) Explain the operation of mobile IP with the help of a suitable schematic diagram and provide suitable examples.

   (*b*) Describe the concept behind reverse tunneling. 8+6=14

3. (*a*) Explain various applications of Mobile Computing.

   (*b*) Compare GSM and CDMA. 8+6=14

4. (*a*) What is a hand-off technique?

   (*b*) Distinguish between soft and hard handover.

   (*c*) What do you mean by Mac? 3+8+3=14

5. (*a*) What do you mean by modulation technique? Explain.

   (*b*) Discuss frequency modulation and amplitude modulation.

   (*c*) What is Bluetooth? Explain. 3+8+3=14

6. (*a*) Explain why the tunneling procedure is used.

   (*b*) Briefly explain LEO. 8+6=14

7. Compare and contrast various popular mobile OS. Explain about the multicast routing protocol. 8+6=14

8. State the difference among 1G, 2G, 2·5G and 3G. 14

(16)

(Automata Theory)

Answer any **five** questions.

1. (a) Minimize the following finite automata.
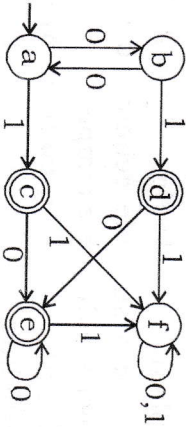
(b) Convert the following Mealy machine into its equivalent Moore machine.

Present State	I/P=0		I/P=1	
	Next State	O/P	Next State	O/P
→ A	C	0	B	0
B	A	1	D	0
C	B	1	A	1
D	D	1	C	0

7+7=14

2. (a) Reduce the following grammar :

S → aAa

A → Sb|bCC|DaA

(17)

C → ab|DD

D → aDA

E → aC

(b) Convert the following grammar into CNF:

S → a|b|cSS   7+7=14

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

S → AA|a

A → SS|b

(b) Construct a regular grammar G generating the regular set represented by P=(a + b)*ab*a(a + ab + ba).   7+7=14

4. (a) Explain about derivation and parse tree. Construct the string 0100110 from the leftmost and rightmost derivation :

S->0S/AA

A->0/1A/0B

B->1/0BB

(18)

(b) Find the parse tree for generating the string 11001010 from the given grammar :

S->1B/0A

A->1/1S/0AA

B->0/0S/1BB   7+7=14

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

State	Input=0	Input=1
q_0	q_1, q_3	q_2, q_3
q_1	q_1	q_3
q_2	q_3	q_2
q_3	--	--

(q_0 is the initial and q_3 is the final state)

(b) Construct a DFA accepting all strings w over {a, b} such the that number of a's in w is divisible by 3.   7+7=14

6. (a) Classify grammars according to Chomsky. Define each of them with suitable examples.

(b) Show that $L=\{a^n b^n | n \geq 1\}$ is not regular.   7+7=14
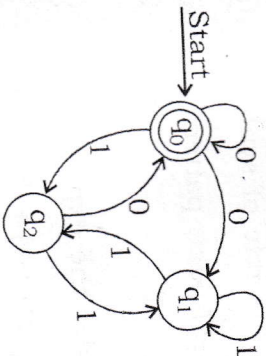
(19)

7. Deduce equivalent R.E. from the Figure below. Prove regular languages are closed under union and complement operation :   7+7=14

8. Construct a Turing Machine that recognizes the language $L = \{0^{nm} : n, m >= 0\}$.   14

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(20)

(Compiler Design)

Answer any **seven** questions.

1. (a) Define cross compiler.

   (b) Write the role of syntax analysis.

   (c) Define Token, pattern, lexeme.

   $$2\frac{1}{2}+2\frac{1}{2}+5=10$$

2. (a) Consider the expression

   $$a + a*(b-c) + (b - c)*d$$

   Find the DAG for the expression.

   (b) How can ambiguity be eliminated? $5+5=10$

3. (a) Compute FIRST and FOLLOW sets of the grammar :

   S → ABa|bCA

   A → CBCA|t

   B → CdA|ad

   C → eC|t

   D → bSf|a

   (b) Write the role of lexical analyzer. Explain with diagram. $6+4=10$

(Continued)

(21)

4. (a) Define handle with example.

   (b) Check if the grammar is either SLR(1) or not.

   $$S → L=R|R$$

   $$L → *R|id$$

   $$R → L$$

   (c) Define Left factoring with example. $2+6+2=10$

5. Generate the syntax directed scheme

   E → E$

   E → E+E

   E → E*E

   E → (E)

   E → I

   I → Idigit

   I → digit

   to evaluate the expression $(4 + 7 + 19)*2$. Give the anotet parse tree and the translation for this string.   10

(Turn Over)

(22)

6. (a) Differentiate between LL and LR parser.

   (b) Check the grammar whose productions are

   $S \rightarrow AaAb|BbBa$

   $A \rightarrow \varepsilon$

   $B \rightarrow \varepsilon$

   is LL(1).

   (c) What is address code?   2+4+4=10

7. Construct LALR parsing table of the following grammar :   10

   $S \rightarrow CC$

   $C \rightarrow cC|d$

8. (a) Write the major structure of compiler.

   (b) Give an example of semantic analysis with proper explanation.

   (c) What is three address code?   5+3+2=10

9. (a) Write about basic block and Control Flow Graph.

/751   (Continued)

(23)

   (b) Consider the following code and find basic block and Control Flow Graph :

```
fact(x)
{
    int f=1;
    for (i=2;i<=x;i++)
        f=f*i;
    return(f);
}
```

    4+6=10

10. (a) Write the rules for checking if the grammar is LL(1) or not.

    (b) Write down the algorithm for constructing shift reduce parsing table.

    (c) Write a short note on symbol table.   2½+5+2½=10

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