2018

BCA 5th Semester Examination

ELECTIVE—I

PAPER—3104

Full Marks : 70

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.

Applied Graph Theory

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

1. Answer any *five* questions :　　　　　　　　5×2

   (a) Define walk, path and circuit in a graph.

   (b) What is meant by ecentricity ?

   (c) Define 1-isomorphic and 2-isomorphic.

   (d) What are the applications of planar graph ?

(e) Define minimal dominating set and maximal independent set.

(f) Find the chromatic number of a complete graph of n vertices.

(g) Why the graph is enbedding on sphare.

(h) Briefly explain combinational and geometric graphs.

2. (a) Show that the maximum number of edges in a simple graph with n vertices is $n(n-1)\big/2$.

(b) Prove that if a graph has exactly two vertices of odd degree, there must be path joining these two vertices.

(c) Prove that any two simple connected graphs with n vertices, all of degree two, are isomorphic. 4+6+5

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

(b) Show that starting from any spanning tree of a graph G, every other spanning tree of G can be obtained by Successive cyclic interchanges.

(c) Prove that the ring sum of any two cut-sets in a graph is either a third cut-set or an edge disjoint union of cut-sets. 4+6+5

(Continued)

4. (a) Define Euler graphs.

(b) State and prove the Euler's theorem for a connected planar graph G with n vertices, m edges and number of regions r.

(c) Show that in a complete graph with n vertices where n is an odd number and $n \geq 3$, there are $(n-1)2$ edge Hamilton cycles. 3+6+6

5. (a) Define the dual of a graph G. Prove that a graph G has a dual G if and only if it is planar. Write the properties of graph and dual graph.

(b) Define incidence and adjancy matrices of a graph. Find the incidence and adjancy matrices of the following graph :

(6+3)+6

(Turn Over)
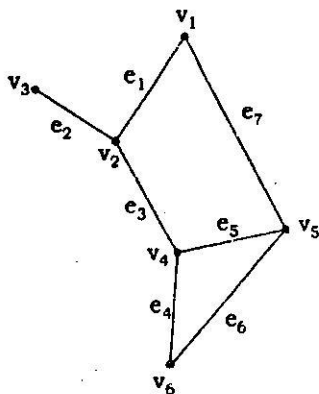
6. (a) Define radius and diameter of graph. Prove that every tree has either one or two centers.

(b) Define outsets and fundamental circuit of a graph. Prove that every circuit has an even number of edges in common with ant cutset.

(c) What is null graph ?   (2+5)+(2+5)+1

7. (a) Define embedding graph.

(b) Show, by drawing the graphs, that two graphs with the same rank and the same nullity need not be 2-isomorphic.

(c) State Kuratowski's theorem and use it in order to prove the graph in.Fig-below :
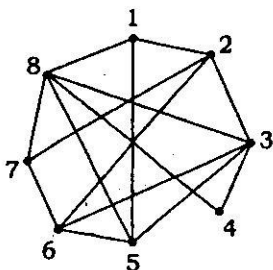
2+5+8

Web Design and Application

Answer Q. No. 1 and any *four* questions.

1. Answer any *five* questions : 5×2

   (a) Define Domain name.

   (b) What do you mean by IP ?

   (c) Why MARQUEE does in HTML ?

   (d) What is the difference between text and hypertext ?

   (e) What is the use of port address ?

   (f) Why frame has become obsolete in HTML 5 ?

   (g) What is the difference between <sup> and <sub> ?

2. (a) What do you mean by a markup language ?

   (b) What are the differences between HTML and XML ?

   (c) Explain Document Object Model (DOM) ? 4+6+5

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

   (b) What do you mean by ISP ? Discuss how information travels through an ISP.   (3+5)+(3+4)

4. (a) What is a session ? What advantages do you have with session ? Is session a secure object ?

   (b) How can we declare a string in Java Script ? Write a program to concatenate two strings in Java Script.

                                                      (3+3+2)+(3+4)

5. (a) What is Internet ? Discuss the evaluation and applications of the internet.

   (b) What is a Search Engine ? How web services are accessed in a webpage ?   (3+4)+(3+5)

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

   (b) What is DNS ? State the applications of DNS.

                                                      (3+6)+6

7. Explain the following in details : 3×5

(a) Layers of Netscape ;

(b) URLS ;

(c) Hypertext Transfer Protocol.

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Fuzzy Logic and Neural Network

Answer any *five* questions.

1. (a) Describe fuzzy sets and membership function. Also differentiate fuzzy set with classical (crisp) sets.

(b) What do you understand by Defuzzification ? Mention one method applied for defuzzification ? (4+3)+(2+5)

2. (a) What is XOR problem ? Draw and explain the architectural graph of network for solving the XOR problem.

   (b) Describe briefly about the different learning methods in
      Neural Network.   7+7

3. (a) What is tautology ? Explain with the help of example.

   (b) If A and B are two fuzzy events of sample space S, prove
      that

$$p(A/B) + p(A^c/B) = 1. \qquad (2+5)+7$$

4. (a) What are the limitations of 'Perceptron' Model ? Explain.

   (b) Explain the architectural details and algorithm of
      'ADALINE' model.   7+7

5. (a) Fuzzy set A and B are defined in the internal
     X = [0, 1, 2, ..., 10] of real numbers by the membership
     function

$$\mu_A(x) = X(x+2), \quad \mu_B(x) = \frac{1}{x^2}.$$

Determine ;

  (i) $A \cap B$;

                                       (Continued)

   (ii) $\overline{A} - B$;

   (iii) $A \cap \overline{B}$.

(b) Discuss the essential difference between supervised and unsupervised learning in neural networks.　7+7

6. (a) Generate the output of NOR & NAND using Mc Culloch Pitts model.

(b) Use max-min composition and max-product composition to find the relation R(x, y) given

$$R(x, y) = \begin{bmatrix} 0.8 & 0.6 & 1 \\ 0.2 & 0.2 & 1 \\ 0.6 & 0.2 & 0.9 \end{bmatrix} R(y, z) = \begin{bmatrix} 1 & 0.7 \\ 0.2 & 1 \\ 0.2 & 1 \end{bmatrix}$$　7+7

7. Write short notes on (any *two*) :　2×7

   (a) BAM ;

   (b) Recurrent networks ;

   (c) Knowledge base infuzzy logic controller.

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Advanced UNIX and Shell Programming

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

1. Answer any *five* questions :   5×2

   (a) How will you hide a file in UNIX ?

   (b) What do you mean by 'mounting a file system' ?

   (c) What does $$ represent ?

   (d) Write the UNIX command to see the last access time of various files in the file system.

   (e) What is output redirection ?

   (f) Differentiate between line editor and screen editor.

   (g) What do you understand by root directory ?

2. (a) Explain the architecture of UNIX operating system.

   (b) What is difference between touch and cat commands ? Give examples of each one.

(Continued)

(c) What are the special features of X window architecture ?

4+4+7

3. (a) What do the following UNIX system variables signify ?

(i) HOME

(ii) IFS

(iii) LANG

(iv) PSI

(v) SHELL.

(b) What are the various file types supported by UNIX ?

(c) Define system call.

(5×2)+3+2

4. (a) Describe the different ways of using chmod.

(b) Briefly describe different modes of vi editor.

(c) What are the different run levels of UNIX ?   5+5+5

5. (a) What is quoting ? What are three quote tokens ?

   (b) Differentiate between line editor and screen editor.

   (c) Where are the security levels available in UNIX ?

   (d) What are the similarities between a thread and a process ?   (2+3)+3+4+3

6. (a) Write a shell script which reads two file names as arguments and checks whether the two files, contents are same or not. If they are same, second file should be deleted.

   (b) Write a shell script which asks the user to enter a character and then determines whether the user entered a small case letter, a capital case letter, a digit or a special symbol.

   (c) Write a shell script to reverse an integer.   5+5+5

(Continued)

7. Write short notes (any *three*) :　　　　　　　3×5

   (a) Fork ;

   (b) Super block ;

   (c) Umask ;

   (d) Wild card characters.

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Mobile Computing

Answer any *seven* questions.

1. (a) Define Mobile Computing. Define GPRS system.

   (b) Explain Wireless MAC issues in detail.　　(2+3)+5

2. (a) Explain various applications of Mobile Computing.

   (b) Compare GSM and CDMA.　　　　　　5+5

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3. What is encapsulation ? Explain in detail the various encapsulation techniques in Mobile IP.   10

4. Explain GSM architecture in detail.   10

5. (a) Write the difference between TCP and UDP.

   (b) Define Route Optimization.

   (c) Discuss MAC layer Blue tooth system.   3+2+5

6. (a) Explain mechanism for IP packet delivery using Mobile IP.

   (b) Explain DHCP in detail.   5+5

7. (a) What is SIM ? Write its functions.

   (b) Explain Tunneling.   5+5

8. (a) Explain DSDV routing algorithm.

   (b) Write about J2ME in brief.   5+5

(Continued)

9. State the difference between 1G, 2G, 2.5G and 3G.   10

10. Write short notes on (any *two*) :   5+5

    (a) IPV6 ;

    (b) FDMA ;

    (c) CDMA ;

    (d) Dynamic Source Routing.

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Automota Theory

Answer any *five* questions :   5×14

1. (a) Convert the Mealy machine into Moore machine.

Present State	Input = 0		Input = 1	
	Next State	Output	Next State	Output
Q_1	Q_2	1	Q_1	0
Q_2	Q_3	0	Q_4	1
Q_3	Q_1	0	Q_4	0
Q_4	Q_3	1	Q_2	1

(b) Minimize the following machine by determining the set of equivalent states.

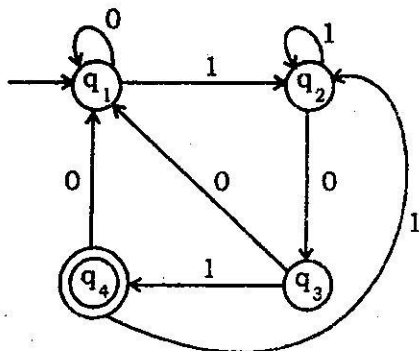| Present State	Input = 0		Input = 1	
	Next State	Output	Next State	Output
A	E	1	C	0
B	C	0	A	0
C	B	0	G	0
D	G	0	A	0
E	F	1	B	0
F	E	1	D	0
G	D	0	G	0
H	F	1	B	0

(c) Prove that CFLs are not closed under intersection and complement operation. 4+5+5

2. (a) Prove that the grammar $(\{S\}, \{a\}, \{S \rightarrow S + S \mid S * S \mid a\}, S)$ is ambiguous.

(b) Remove the unit production from the following grammar :

$S \rightarrow AB \mid aC, A \rightarrow a. \ B \rightarrow C \mid b, \ C \rightarrow D, D \rightarrow E, E \rightarrow a$

(c) What do you mean by Inverse machine ? Write the definition of lossless machine. 5+5+(2+2)

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

(b) Design an FA which accepts all strings having 010 or 110 as substring over $\sum = \{0, 1\}$.

(c) Show that $L = \{a^p \mid p \text{ is prime}\}$ is not regular. 4+3+7

4. (a) Convert the following grammar into its equivalent CNF.

$S \rightarrow aAbB, A \rightarrow abAB \mid aAA \mid a, B \rightarrow bBaA \mid bBB \mid b$

(b) Find the regular expression corresponding to the following FA :

7+7

5. (a) Design a PDA which accepts $L = \{W \in (a, b)^* \mid W$ has equal numbers of a's and b's.$\}$

(b) Consider the Turing machine given below. Draw the computation sequence of the input string 00.

Pesent State	Tape Symbol		
	b	0	1
Q_1	$1LQ_2$	$0RQ_1$	—
Q_2	bRQ_3	$0LQ_2$	$1LQ_2$
Q_3	—	bRq_4	Brq_5
Q_4	$0RQ_5$	$0RQ_4$	$1RQ_4$
Q_5	$0LQ_2$	—	—

7+7

6. (a) Find the Context Free Grammar for the following language $L = \{a^n b^{2n} c^m : n >= 1, m >= 0\}$.

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

$S \rightarrow aAB / bBA$

(Continued)

A → bS / a

B → aS / b

Check if the string *abbaaabbbab* is accepted by the PDA or not.   7+7

7. (a) What are Kleene Closure and Positive Closure ? Give examples for both.

(b) Convert the following grammar into GNF :
S → ABb | a, A → aaA | B, B → bAb .

(c) List some identities of regular expression.   (2+2)+7+3

8. Write short notes (any two) :

(a) Chomsky's classification of grammar ;

(b) Linear bounded automation ;

(Turn Over)

(c) Top down parsing ;

(d) Decidable language.

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Compiler Design

Answer any *seven* questions.

1. (a) Write down the role of a lexical analyzer.

   (b) Define tokens, patterns and lexemes.

   (c) What is LR parser ? Write down the advantages of LR parsing.

   (d) What is source to source compiler ?   2+3+(2+2)+1

2. (a) Consider a context free grammar

   $$S \rightarrow (L) \mid a, \qquad L \rightarrow L, s \mid s$$

   with string $((a, a), a, (a))$

   Give the left most derivation of the string.

(b) Construct the NFA for the following Regular expression :

$$(0^* + 1^*)^*.$$

(c) Write the algorithm to compute FIRST and FOLLOW set of a grammar. 2+4+4

3. (a) Write down the conditions for LL(1) grammar.

(b) Check the grammar whose productions are :

$$S \rightarrow AaAb \ / \ BbBa$$
$$A \rightarrow \in$$
$$B \rightarrow \in$$

is LL(1) ?

(c) Differentiate between LL and LR parser. 4+4+2

4. (a) What is three address code ?

(b) Translate the expression

$$a = b * - c + b * - c$$

into,

(i) Quadruples

(ii) Triples

(iii) Indirect Triples.

(Turn Over)

(c) Define Handle with example.   2+6+2

5. (a) "An LR parser may encounter two types of conflicts" —
    Discuss with proper explanation.

   (b) Construct SLR parsing table for the following grammar :

$$S \rightarrow AS \mid b$$
$$A \rightarrow SA \mid a.$$ 4+6

6. (a) Design LALR(1) parser for the $S \rightarrow Aa \mid bAc \mid dc \mid bda$
    following grammar :

$$A \rightarrow d$$

   (b) Construct the DAG for the following expression :

$$a + a + (a + a + a + (a + a + a + a)).$$ 8+2

7. (a) What is Left Recursive grammar ? How to eliminate left
    recursion ? Eliminate left recursion from the following
    grammar :

$$S \rightarrow Aa \mid b$$
$$A \rightarrow Ac \mid Sd \mid \in$$

   (b) Consider the grammar

$$S \rightarrow a \, / \, \wedge \, / \, (T)$$
$$T \rightarrow T, \, S/S$$

   Draw a parse tree for

$$((a, a), \wedge, (a)), a).$$ (2+1+3)+4

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

(b) Compute FIRST and FOLLOW sets of the grammar :

$$S \rightarrow ABa \mid bCA$$
$$A \rightarrow CBCA \mid t$$
$$B \rightarrow CdA \mid ad$$
$$C \rightarrow eC \mid t$$
$$D \rightarrow bSf \mid a.$$

4+6

9. (a) List the problems of top-down parsing.

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

$$S \rightarrow L = R \mid R$$
$$L \rightarrow *R \mid id$$
$$R \rightarrow L$$

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

2+6+2

10. Write short notes on (any *four*) : $2\frac{1}{2} \times 4$

(i) Left factoring ;

(ii) Symbol Table ;

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(iii) Cross Compiler ;

(iv) Handle ;

(v) Flow graph ;

(vi) Recursive Descent Parser.

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