NEW

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 sub-graph.

   (b) What is Hamiltonian Path ?

   (c) Define Bipartite graph.

   (d) What are the major properties of Isomorphic graphs ?

   (e) What is null tree ?

(f) Define maximal independent set of a graph.

(g) Define an Eulerian graph.

2. (a) Define Hamiltonian Circuit. Prove that a complete graph with n vertices, there are $(n-1)/2$ edge disjoint Hamiltonian Circuits of n, n is odd numbers ≥ 3.

(b) Show that no graph shown in figure 1 has no Eulerian Circuit :
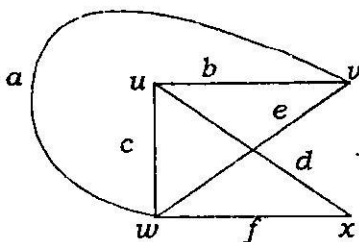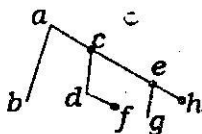

(c) Prove that a simple graph with n vertices and k compounds can have at most

$$\frac{(n-k)(n-k+1)}{2} \text{ edges.}$$ 2+4+3+6

3. (a) What is binary tree ? Prove that the number of levels in a binary tree T is $(n+1)/2$, where n is the number of vertices.   2+5

(b) Show that every tree T has either one or two centre.

8

(Continued)

4.

(a) What is rooted tree ? Determine following from the above Figure

   (i) What is root of T ?

   (ii) Find the leaves and internal vertices of T.

   (iii) What are the levels of C and e ?

   (iv) Find the children of C and e.

   (v) Find the descendants of the vertices a and c.

(b) What is binary tree ? For a binary tree T with n vertices, show that the minimum possible height is $[\log2(n+1)-1]$. Prove that the maximum number of vertices on level n of a binary tree is 2^n, where $n \geq 0$.

$$2+5+2+3+3$$

5. (a) Define Planer graph. Prove that any simple planar graph can be embedded in a plane such that every edge is drawn as a straight line segment.   2+4

(b) Show that a Covering g of a graph vs minimal if and only if g contains no paths of length three or more.

   5

(c) What is the concept *of embedding* ? Define path in a graph.   2+2

6. (a) Define in-degree and out-degree of a graph.

   (b) Write an algorithm to find the shortest path between any specific vertex to another specified vertex.

   (c) Define 'source' and 'sink' of a directed graph.

   4+7+4

7. (a) For any positive integer n, if G is a connected graph with n vertices and $n-1$ edges, then prove that G is a tree.

   (b) Prove that a simple graph G has a spanning tree if and only if G is connected.

   (c) Write short notes on :

   (i) Incidence matrix

   (ii) Directed graph.

   5+4+3+3

(Web Design & Application)

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

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

   (a) How do you make as image an a background on your web pages ?

   (b) What does "1"+2+4 evaluate to ?

(c) What is the difference between the Internet and world wide web?

(d) How do I register a domain name ?

(e) State the difference between local IP and online IP.

2. (a) Explain the basic types of firewalls.

(b) Give difference between container and empty element.

(c) Explain the syntax. <HR> tag ?

(d) How do you include an image in an HTML document ?

(e) Write the names of five commonly used internet protocols.   5+3+2+3+2

3. (a) Describe the ways of creating Arrays in Java Script.

(b) What is a mark-up language and what is the relationship between XML and HTML ?   10+5

4. (a) What is validation ? Explain non-breaking space in HTML ? Do all HTML tags come in pair ? Explain.

(b) What is the advantages of collapsing white space.

(c) Does hyperlink apply only to text ? What is the advantage of using frame ?   5+5+5

5. (a) What is DHTML ?

(b) How DHTML works with Java Script ?

(c) What are the advantages of DOM ?

(Turn Over)

(d) Define CSSP.

(e) Explain structure of a URL.   3+3+3+3+3

6. (a) Briefly discuss the attributes of the form tag.

(b) How can a mail be directly linked to a text.

(c) What was the cause of deprecating Frame tag in HTML 5.

(d) How AJAX works on web page ?

(e) What do you mean by browser compatibility ?

                                          4+3+3+3+2

7. (a) What is a Cookie ? Give an example.

(b) What do you mean by dot-com boom ?

(c) Briefly explain the basic architecture of TCP/IP protocol ?

(d) Differentiate between IPV4 and IPV6.   3+2+6+4

(Fuzzy Logic & Neural Network)

Answer any *five* questions.

1. (a) Define classical set with help of example.

(b) Differentiate fuzzy set from classical set and name the properties of classical (crisp) sets.   7+7

(Continued)

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

(b) Discuss about output representation and decision rule. 4+5+5

3. (a) Explain what do you mean by the terms ADALINE and MADALINE ?

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

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

4. (a) Differentiate between single layer and multi layer network.

(b) Generate the output of OR, NOT using Mc culloch Pitts model. 7+7

5. (a) Show how the Hopfield net may be used to maximize an objective function, by recasting the objective as one to be minimized.

(b) What do you mean by BAM. 8+6

6. (a) Draw and explain the architecture of back propagation network.

(b) What is tautology ? Explain with the help of example. 7+2+5

7. (a) Use max-mm composition and max-product composition to find the relation $R(X, Y)$ given. 7

$$R(X,Y) = \begin{bmatrix} 0.6 & 0.4 & 1 \\ 0 & 0 & 1 \\ 0.4 & 0 & 0.9 \end{bmatrix} \quad R(Y,Z) = \begin{bmatrix} 0.8 & 0.5 \\ 0 & 1 \\ 0 & 0.8 \end{bmatrix}$$

(b) Fuzzy set A and B are defined in the interval $X = \{0, 1, 2 \ldots 10\}$ of real numbers by the membership function

$\mu_A(X) = X/(x+2), \mu_B(x) = 2^{-x}$.   Determine   (1) $A \cup B$

(2) $A \cap B$ (3) $\bar{A}$ (4) $\bar{B}$.   7

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(Advance UNIX and Shell Programming)

Answer Q. No. 1 and any *four* from the rest :   5×14

1. Answer any *seven* questions :   7×2

   (a) How will you view a hidden file in a directory in Unix ?

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

   (c) List two functions performed by Unix system administrator.

   (d) What is the function of GRUB ?

   (e) What is i-node ?

   (f) What is Zombie state ?

(g) What is a pipe ?

(h) Explain the utility of wait() function.

(i) Write the difference between named and unnamed pipes.

2. (a) Briefly explain the features of UNIX Operating System.

(b) What ware absolute and relative path. Explain with example.

(c) Explain the importance of unit process.   5+5+4

3. (a) Differentiate between :

   (i) mount and unmount system calls.

   (ii) hard link and soft link

   (iii) gzip and gunzip

(b) What is redirection ? Explain different redirection operators.   (3×3)+(2+3)

4. (a) What is regular expression ? List out the components of it ?

(b) What are the different run levels in Unix ?

(c) Why PID and PPID are used ?   (2+3)+5+(2+2)

5. (a) What is umask ? With a suitable example, explain how it can be used to set file permissions.

(b) With the help of a proper example, briefly describe the concept of job scheduling in Unix.

(c) What are the significance of using touch and cat commands ?   (2+2)+6+(2+2)

6. (a) Write a shell script to determine if an integer is prime or not.

(b) Write a shell program to generate Fibonacci series ulto *n* terms.

(c) Write a shell program to check the no. of vowels in a text file. Assume that the filename is provided as an argument.   5+5+4

7. (a) Write the advantages and disadvantages of buffer cache.

(b) What is region ? How a region is allocated with a process.

(c) Write an algorithm for handling signal.   5+5+4

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(Mobile Computing)

Answer any *seven* questions.

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

    (b) Give reasons for a handover in GSM and the problems associated with it. Discuss the typical steps for handover. What types of handover can occur ?

    5+5

2. (a) Compare SDMA, FDMA, TDMA and CDMA.

    (b) How can hidden and exposed terminal problems can be avoid ' ? Explain. 5+5

3. What are t .e mc ivation for a specialized MAC ? Discuss in detail the multiple access with collision avoidance techniques. 10

4. (a) Explain the basic requirements of mobile IP.

    (b) Explain how tunneling works in general and especially for mobile IP using IP-in-IP, minimal and generic routing encapsulation respectively. Discuss the advantages and disadvantages of these three methods.

    5+5

5. (a) Explain the concept behind the traditional TCP. What are the improvements that are made into the classical TCP.

(b) Why do we go for ITCP ? What are the advantages and disadvantages of it? 5+5

6. (a) Explain the operation of selective tuning and indexing techniques.

(b) Describe domain-dependent specific rules for data synchronization. 5+5

7. (a) Discuss the protocol architecture of JEEE 802.11.

(b) Explain DHCP in detail. 5+5

8. (a) Describe the Bluetooth Protocol stack with diagram.

(b) List and explain the applications of adhoc network. 5+5

9. Explain in detail about wireless application Protocol and its architecture. 10

10. Write short notes (any *two*) : 5+5
    (a) IPV6 ;
    (b) DAB & DVB ;
    (c) SIM ;
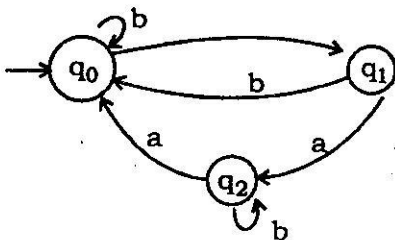   (d) UDP ;

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(Continued)

(Automata Theory)

Answer any *five* questions :

1. (a) Explain Arden's Theorem. By using this theorem construct a regular expression corresponding to the atuomata given below : 2+5
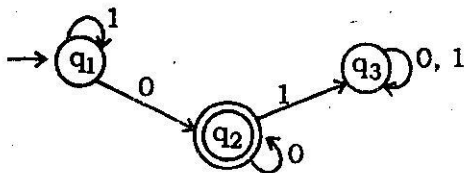
(b) Convert the following DFA into a regular expression using state climination. Be sure to show intermediate steps of the process. 7

2. (a) Reduce the following grammar to GNE

$$S \rightarrow AO, A \rightarrow OB, B \rightarrow OA, B \rightarrow 1$$ 5

(b) The set $L = \left\{ a^i b^j 2^k \mid \text{where } i, j, k \text{ integer and } i, j, k \geq 1 \right\}$. Is L regular ? Justify your answer.   5

(c) Write the CFG for the language $L = \left\{ 0^i 1^j 2^k \mid i = j \text{ or } j = k \right\}$ 4

3. (a) Prove that CFLs are not closed under intersection and complement operation.   5

(b) Show that $L = \left\{ 0^n 1^n \mid n \geq 1 \right\}$ is not regular.   5

(c) Show that transition diagram of a finite state automation that accepts all strings over $\{0, 1\}$

   (i) having odd number of 0's

   (ii) having even number of 0's and even number of 1's.   2+2

4. (a) Design an NPDA for accepting the language

   $$L = \left\{ WWR : W \in \{a, b\}^+ \right\}$$ 7

(b) Construct the minimum state automata equivalent to given automata M defined below.   7

(Continued)

Σ State	a	b
→ q_0	q_5	q_1
q_1	q_2	q_6
*q_2	q_2	q_0
q_4	q_5	q_7
q_5	q_6	q_2
q_6	q_4	q_6
q_7	q_2	q_2

*q_2 → final state.

5. (a) Construct a ≠ A recognizing the following Grammar 7

   $S \longrightarrow as / bA / b$

   $A \longrightarrow aA / bs / a$.

(b) State and explain Arden's theorem with a suitable example. 7

6. (a) With the help of Schematic diagram explain the function of DFA. What are the reasons to say it is deterministic 5+2

(b) Construct left linear and right linear grammar for the regular expression $(0/1)*00(0/1)$. 7

(Turn Over)

7. (a) Convert the following grammar to CNF.

$$S \longrightarrow bA\ /\ aB$$
$$A \longrightarrow bAA\ /\ as\ /\ a$$
$$B \longrightarrow aBB\ /\ bs\ /\ b$$

(b) Discuss different language and their corresponding machine.   8+6

8. (a) Define push down automata obtain PDA to accept all strings generated by the language

$$\left\{ a^n b^m a^n\ /\ m, n \geq 1 \right\}$$

(b) Find the equivalent CFG with no useless symbols.

$$S \longrightarrow ABC\ /\ BaB$$
$$B \longrightarrow bBb\ /\ a$$
$$A \longrightarrow aA\ /\ BaC\ /\ aaa$$
$$C \longrightarrow CA\ /\ AC$$

                                                                                8+6

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

(a) PCP

(b) LR(k) grammar

(c) Universal Tuning m/c

(d) Church's hypothesis

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(b) Compute the FIRST and FOLLOW sets for each nonterminal of the grammar given below :

$S \to ABa \,|\, bCA$

$A \to cBCD \,|\, \epsilon$

$B \to CdA \,|\, ad$

$C \to eC \,|\, \epsilon$

$D \to bSf \,|\, a$ 4+6

4. (a) $S \to aSbS \,|\, bSaS \,|\, \epsilon$ with string *aabbab*.

(i) Give the left most derivation for the string.

(ii) Give the right most derivation for the string.

(iii) Give the parse tree for the string.

(iv) Is the grammar ambiguous or unambiguous ? Justify.   1½+1½+2+2

(v) Describe the language generated by the grammar.
3

5. Convert the following Regular expression to corresponding NFA using Thompson's algorithm and convert its corresponding DFA.

$RE = (a^* \,|\, b^*)^* a$.   10

6. Show that the following grammar

$S \to Aa \,|\, bAc \,|\, Bc \,|\, bBa$

$A \to d$

$B \to d$

is LR(1) but not LALR(1).　　　　　　　　　10

7. (a) What do you mean by LL(1) and SLR(1) grammar.

(b) Show that the following grammar :

$S \to AaAb \mid BaBa$

$A \to \epsilon$

$B \to \epsilon$

is LL(1) but not SLR(1).　　　　　　　　2+8

8. (a) What is left recursion ?

(b) How to eliminate left recursion from a group of production ?

(c) Prove that, every SLR(1) grammar is unambiguous, but there are many unambiguous grammars that are not SLR(1) : Justify.　　　　2+3+5

9. Write short notes on : (any *two*)　　　　2×5

(i) Symbol table

(ii) Top down parsing

(iii) Lexical Analysis

(iv) Code Optimization

10. (a) What is ambiguous grammar ?

Check the following grammar for the sentences.

Id +Id*Id

$E \rightarrow E+E \mid E^{*}E \mid (E) \mid E \mid id.$

(b) Define Quadruple representation.   (6+2)+2

11. (a) Construct parsing table in case of predictive parsing for the following grammar.

$E \rightarrow E+T \mid T$

$T \rightarrow T^{*}F \mid F$

$E \rightarrow (E) \mid Id$

(b) Find the FIRST and FOLLOW for the above grammar.

6+4

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