**NEW**

**2015**

**BCA**

**5th Semester Examination**

**ELECTIVE - I**

**PAPER—3104**

*Full Marks : 70*

*Time :* 3 Hours

*The figures in the 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 Chromatic number of a graph.

(b) Define centre of a tree.

(c) Write down the properties of a dual of a planar graph.

(d) Define trail in a graph.

**2.** (a) What is Euler graph ? Prove that a connected graph is an Euler graph iff it can be decomposed into circuits. 8

(b) Define separable graph. Show that vertex connectivity of any graph G can never exceed the edge connectivity of G. 4

(c) Prove that a graph is bipartite if and only if all cycles are even. 3

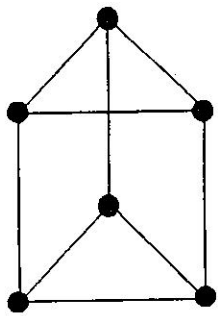
**3.** (a) Show that a simple graph with n vertices (n>2) is Hamiltonian if the sum of the degrees of every pair of non-adjacent vertices is atleast n. 8

(b) Prove that a tree with n vertices has (n–1) edges. 5

(c) What is difference between graph and tree ? 2

**4.** (a) Prove that a connected planar graph with n vertices and e edges has (e – n + 2) regions. 6

(b) Find the ecentricities of all vertices of the following graph. Hence find its radius and diameter. 4



(c) Prove that a complete graph of five vertices is nonplanar. 5

5. (a) Define cutsets and fundamental circuit of a graph. Prove that every circuit has an even number of edges in common with any cutset. 7

(b) Explain the colouring problem of a graph. 3

(c) Show that in a connected graph G, any minimal set of edges containing at least one branch of every spanning tree of G, is a cutset. 5

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## ( Web Design & Application )

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

1. Answer any *five* questions : 5×3

(i) Why do we use MARQUEE in a web page ?

(ii) What do you mean by CSS ?

(iii) How dynamic page differs from static page ?

(iv) How do you make a image as a background on a web page ?

(v) What are Javascript types ?

(vi) Why IP address is required ?

(vii) What is WPP ?

2. (a) How does the informations are being carried over on internet ? 6

   (b) How domain name server helps in communication ? 4

3. (a) What is Classical addressing ? Give their classes. 2+2

   (b) What is the difference between TCP and UDP ? 3

   (c) How can we add images into a front page ? 3

4. (a) What is a document object model and why is it needed ? 4

   (b) How can we create an array and a function in Javascript ? 4

   (c) What do you mean by 'Hypertext' ? 2

5. (a) Briefly state the different phases of building a website. 7

   (b) What is the difference between TD and TH tag of HTML ? 3

6. (a) What do you mean by WAP ? 2

   (b) Briefly explain the different sections of a webpage ? Give example. 6

   (c) What is a loop back IP ? 2

7. (a) Differentiate between server side scripting language and client side scripting language. 4

(b) State and explain the different layers of Netscape. 6

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

(a) www ;

(b) Stylesheet ;

(c) URL ;

(d) DNS ;

(e) XML ;

(f) HTTP.

9. (a) Briefly describe the function of Network layer. 5

(b) How a Javascript can be related to a DHTML page ? 3

(c) What is meta tag ? 2

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## ( Fuzzy Logic & Neural Network )

Answer any *five* questions.

1. (a) What is artificial Neural Network ? 2

(b) Explain how the network training time and accuracy is influenced by the size of the hidden layer. 4

(c) Write down the difference between training and learning. 4

(d) Explain the limitations of back propagation learning. 4

**2.** (a) What is fuzzy based controller ? 2

(b) What a short notes on the following : 4×3

(i) Adaptative fuzzy system ;

(ii) fuzzy neural network ;

(iii) Supervised learning ;

(iv) fuzzification interface.

**3.** (a) Develope a membership function for a fuzzy set A = 'Above 60 years', B = 'above 55 years' from universal set of possible ages for people. 5

(b) Prove that the following statements are tautology :

$$((P \rightarrow Q) \wedge P) \rightarrow Q .$$ 4

(c) Let U = {a, b, c, d} be the domain and A and B be the fuzzy sets on U. A is given by = (·5, ·8, ·0, ·3) and B is given by (·2, 1·0, 0·1, ·7). Find (A∪B), (A∩B) and A′. 5

**4.** (a) Differentiate fuzzy set from classical set. 4

(b) State BAM energy function. 4

(c) Define and explain Hopfield network. 6

5. (a) Discuss McCulloch-Pitts Model. 5

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

(c) Discuss reinforcement learning strategy. 3

6. (a) How would you differentiate fuzzy with probability ? 5

(b) Explain lambda cuts for fuzzy sets and fuzzy relations. 6

(c) What do you mean by Defuzzification ? Explain mean of maxima method for defuzzification. 3

7. (a) Explain the architecture of a multilayer artificial neural network. Give a labelled diagram and show its working. 8

(b) Write short note on the following : 2×3

(i) Hebbian learning rule ;

(ii) Delta rule.

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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) What is i-node ?

(b) What do you mean by Zombie state of a process ?

(c) What command is – a do ?

(d) What do you mean by PID ?

(e) How can you make out whether two files are copies or links ?

(f) Which command of vi editor is used to display line number before each line ?

(g) What do you mean by process priority ?

(h) What is X-Widgets ?

(i) What is shared memory ?

2. (a) Discuss mount & unmount system calls. 5

(b) What are internal & external commands ? Where are the security levels available in UNIX ? 4+3

(c) What is Sticky bit ? 2

3. (a) What are egrep and fgrep ? Give examples. 4

(b) Briefly describe mount and unmount system calls. 4

(c) Describe dumb terminal. 4

(d) State why the – r option of rm is dangerous. 2

4. (a) What do you mean by file access permissions ? How can you change the file access permissions ? Explain. 2+3

(b) Describe X-window architecture. What are X-widgets ? 6+3

**5.** (a) Define process. Which command is useful to know the status of process ? Explain it giving example. What are the three phases in creation of a process ? 4

(b) What is the purpose of stream editor ? 3

(c) What do you mean by System calls ? 3

(d) Explain the following commands : (i) kill, (ii) date. 4

**6.** (a) Write a shell program to check if a given string is palindrome. 6

(b) How to synchronize processes using semaphores. 4

(c) Explain about the functions of kernel. 4

**7.** Write short notes (any *four*) : $4 \times 3\frac{1}{2}$

(a) awk ;

(b) fork ( ) ;

(c) signal handler ;

(d) process utilities ;

(e) standard error.

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## ( Mobile Computing )

Answer any *seven* questions.

1. (a) Define mobile computing. Why cells are considered as hexagon in mobile computing? 2+5

   (b) What is a GPRS system? 3

2. (a) What is mobile IP? Briefly explain the layers of mobile IP. 5

   (b) Explain, why the Tunneling procedure is used? 5

3. State the difference between 1G, 2G, 2·5G and 3G. 10

4. (a) Explain the architecture of a GSM system. 6

   (b) Briefly explain LEO. 4

5. Briefly explain the detailed steps that are being carried when a mobile user calls a landline user. 10

6. (a) What is a hand-off technique? 3

   (b) Differentiate between Soft and Hard handover. 4

   (c) What do you mean by MAC? 3

7. Briefly explain the working procedure of FDMA, TDMA and CDMA. 10

8. (a) What do you mean by modulation technique? 3

   (b) Discuss frequency modulation and amplitude modulation. 5

   (c) What is a bluetooth? 2

**9.** How does a mobile system working in roaming. Also, state the functions of HLR and VLR. 10

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

(a) TCP ;

(b) IEEE 802.11 ;

(c) DAB ;

(d) DVB ;

(e) UMTS.

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## ( Automata Theory )

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

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

(a) Define DFA.

(b) What is Mealy machine ?

(c) State Arden's theorem.

(d) Explain derivation tree with an example.

(e) Define CNF.

(f) Explain with example ambiguous grammar.

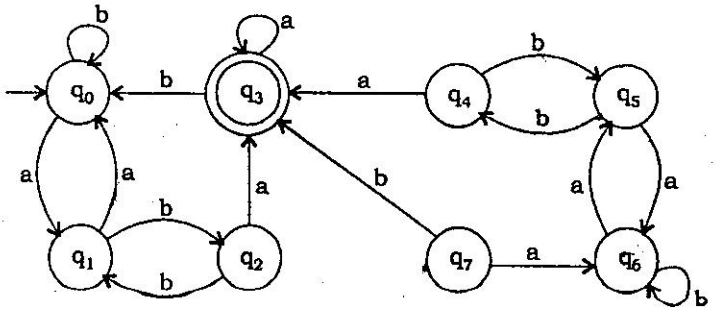
(g) What is unit production ?

(h) Define context free grammer.

**2.** (a) Construct a Mealy Machine which is equivalent to the Moore machine given in the following table : 7

| *Present State* | *Next State* | | *Output* |
|---|---|---|---|
| | a = 0 | a = 1 | |
| → $q_0$ | $q_3$ | $q_1$ | 0 |
| $q_1$ | $q_1$ | $q_2$ | 1 |
| $q_2$ | $q_2$ | $q_3$ | 0 |
| $q_3$ | $q_3$ | $q_0$ | 0 |

(b) Construct the minimum state automaton equivalent to the following transition diagram : 8




**3.** (a) Construct a DFA equivalent to an NDFA whose transition table is given below : 7

| *State* | *a* | *b* |
|---|---|---|
| $q_0$ | $q_1$, $q_3$ | $q_2$ |
| $q_1$ | $q_1$ | $q_3$ |
| $q_2$ | $q_3$ | $q_2$ |
| ($q_3$) | — | — |

(b) Construct a DFA accepting all strings over {a, b} ending in ab. 8

**4.** (a) Let L be the set of all palindromes over {a, b}. Construct a grammar G generating L. 7

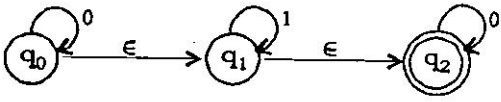
(b) Find a grammar generating $L = \{a^n b^n c^i \mid n \geq 1, i \geq 0\}$. 8

**5.** (a) Construct a DFA with reduced states equivalent to the regular expression :

$$10 + (0 + 11)0 * 1.$$ 10

(b) Show that $L = \{a^P \mid P \text{ is a prime}\}$ is not regular. 5

**6.** (a) Consider the NFA given by following diagram : 7




Find the equivalent NFA without $\epsilon$ - transition.

(b) Given a CFG with production :

$S \rightarrow AB$

$A \rightarrow a$

$B \rightarrow C$

$C \rightarrow D$

$D \rightarrow b$

Eliminating the unit production of obtain an equivalent grammer. 8

7. (a) Construct the finite Automaton which accepts the following expression : 8

$$R = a.(a + b)^*.b.b .$$

(b) Change the following grammar into CNF : 7

$S \rightarrow 1A/0B$

$A \rightarrow 1AA/0S/0$

$B \rightarrow 0BB/1$

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## ( Compiler Design )

Answer any *seven* questions : $7 \times 10$

1. (a) What is the difference between a Compiler and an interpreter ? 2

(b) Explain the different phases of Compiler, showing the output of each compilation phases, using the example : 8

position = initial + rate * 60.

2. (a) What do you mean by actual and formal parameter ? 2

(b) Discuss various parameter passing mechanisms. 5

(c) Consider the context free grammar : $2 \times 1\frac{1}{2}$

$$S \rightarrow (L) \mid a$$

$$L \rightarrow L, S \mid S$$

and the string

(i) ((a, a), a, (a)) (ii) (a, (a, a))

Construct parse tree for these strings.

**3.** (a) What are the benefits of Intermediate code generation ? 2

(b) Convert the following NFA into its equivalent DFA :

$(a/b)^*$ abb. 6

(c) What are the main difference between NFA and DFA ? 2

**4.** (a) Prove that 'Every SLR(1) grammar is unambiguous, but there are many unambiguous grammars that are not SLR (1)'. 6

(b) What do you mean by Handle ? Discuss with example. 2

(c) Check the following grammar is ambiguous or not :

$$S \rightarrow + SS \mid - SS \mid a.$$ 2

**5.** (a) Construct an SLR(1) parsing table for the following grammar : 8

$$S \rightarrow xAy \mid xby \mid xAz$$

$$A \rightarrow aS \mid q$$

$$B \rightarrow q$$

(b) Give bottom-up parses for the input string aaa * a ++ for the grammar :

$$S \rightarrow SS + \mid SS * \mid a$$ 2

**6.** Consider the following grammar :

$$S \rightarrow aBDh$$

$$B \rightarrow cC$$

$$C \rightarrow bC/\in$$

$$D \rightarrow EF$$

$$E \rightarrow g/\in$$

$$F \rightarrow f/\in$$

(a) Find the FIRST and FOLLOW sets. 6

(b) Check whether the above grammar is LL(1) or not. 4

**7.** (a) Define predictive-parsing. 2

(b) Construct the predictive-parsing table for the following grammar : 8

$S' \rightarrow S\#$

$S \rightarrow qABC$

$A \rightarrow a/bbD$

$B \rightarrow a/\in$

$C \rightarrow b/\in$

$D \rightarrow e/\in$

**8.** (a) What is Shift-Reduce parsing ? 2

(b) Consider the following grammar : 8

$S \rightarrow BB$

$B \rightarrow bB/d$

Check whether the given grammar is LALR(1) or not.

**9.** (a) What is meant by syntax-directed translation ? 2

(b) Construct the DAG for the following basic-block : 8

$d = b * c$

$c = a + b$

$d = b * c$

$a = c - d$

**10.** What is a symbol table and why it is needed ? What are the typical contents of a symbol table ? Discuss the various approaches used for symbol table organization.

3+3+4

**11.** Write short note on any *four* : $4 \times 2\frac{1}{2}$

(a) Cross-compiler ;

(b) Context-free grammar (CFG) ;

(c) Finite automata ;

(d) Basic blocks ;

(e) 3-address code ;

(f) Left-Recursion elimination ;

(g) Ambiguous grammar.