P1138

[3464]-333

DEC-2008

B.E. (Computer)

DESIGN AND ANALYSIS OF ALGORITHMS

(2003 Course)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three questions from each section.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) What are the basic components which contributes to the space complexity? Compute the space needed by the following algorithms justify your answer. **[8]**

```
Algorithm Sum (a,n)
{
    s: = 0.0;
        for i: = 1 to n do
            s: = s + a[i];
            return s;
}
```

b) Prove if $f(n) = a_m n^m + \ldots\ldots\ldots\ldots + a_1 + a_0$, Then $f(n) = O(n^m)$. **[8]**

OR

Q2) a) Prove that following algorithm produces a uniform random permutation of the input, assuming that all the priorities are distinct. **[8]**

```
PERMUTE _ BY _ SORTING (A)
n ← length [a]
        for i ← to n
            do P[i] = RANDOM (1,n3)
            Sort A, using P as Sort Keys
            Return A.
```

b) Suppose you flip a fair coin 'n' times, what is the longest streak of consecutive heads that you expect to see and prove your answer. **[8]**

P.T.O.

Q3) a) Write recursive and Non Recursive algorithms for binary search. Determine Time and Space complexity in both the cases. **[8]**

b) Consider the following instances of the Knapsack Problem : n =3, m = 20, (p1,p2,p3) = (24,25,15) and (w1,w2,w3) = (18,15,20) Find the feasible Solutions. **[8]**

OR

Q4) a) Let J be a set of K Jobs and σ = i1, i2,.....ik. a permutation of jobs in J such that d i1 < = d i2 < = ... < = dik. Prove that J is a feasible solution if the jobs in J can be processed in the order σ without violating any deadline. **[8]**

b) Write an algorithm for merge sort. Determine the time complexity of this algorithm. **[8]**

Q5) a) Comment on the statement : "In dynamic programming, many decision sequences may be generated". **[2]**

b) Explain how dynamic programming method can be used for formulating k-stage graph? **[8]**

c) Write a function to compute length of shortest paths of a given graph. **[6]**

d) Enlist the elements of dynamic programming. **[2]**

OR

Q6) a) Two Jobs have to be scheduled on three Processors. The Task times are given by the Matrix J.

$$J = \begin{bmatrix} 2 & 0 \\ 3 & 3 \\ 5 & 2 \end{bmatrix}$$

Show all possible schedules for the Jobs. And Prove there exist an Optimal Schedule. **[8]**

b) Let n = 4 and (a1,a2,a3,a4) = (do,if,int,while), let p(1:4) = (3.3.1.1) and q(0:4) = (2,3,1,1,1). Compute and construct OBST for above values using dynamic programming. **[8]**

c) Comment on the statement: "The principle of optimality does not hold for every problem whose solution can be viewed as the result of sequence of decisions". **[2]**

SECTION - II

Q7) a) Write an Nonrecursive Backtracking Algorithm to solve the 8 Queens Problems? Discuss the time complexity of this algorithm. **[8]**

b) Explain how Branch and bound method can be used to solve Knapsack problem? **[8]**

OR

Q8) a) Write a recursive backtracking algorithm for Sum of subsets of problem. **[8]**

b) Explain in detail Control Abstraction for LC-search. **[8]**

Q9) a) Write an algorithm for prefix computation. Determine its time complexity. **[8]**

b) If a comparison network with n inputs sorts all 2^n possible sequences of 0's and 1's correctly, then prove that it sorts all sequences of arbitrary numbers correctly. **[8]**

OR

Q10)a) Write an algorithm for pointer doubling problem. What is the time complexity of this algorithm? **[8]**

b) Write an odd-even merge parallel algorithm. **[8]**

Q11)a) If L is a Language such that $L^1 \leq P^L$ for some $L \in$ NPC, then prove that L is NP hard. **[8]**

b) Prove that satisfiability with at most three literals per clause α chromatic number decision problem. **[8]**

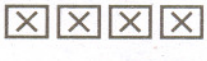
c) What do mean by NP complete problem? **[2]**

OR

Q12)a) Explain how to solve the feedback node set problem(FNS) in polynomial time if we have a polynomial time algorithm that determines a minimum cost realization. **[10]**

FNS : Given a directed graph G = (V,E) and an integer k, FNS is to determine whether there exists subset V' of vertices $V' \subseteq V''$ and $V' \leq k$ such that the graph $H = (V - V', E - \{< u, v> \mid u \ V' \text{ or } v \ V'\})$ obtained from G by deleting all vertices in V' and all edges incident to a vertex in V' contain no directed cycles.

b) Prove FNS α the Optimal code generation for level one dags on a one register machine. **[8]**



Total No. of Questions :12] [Total No. of Pages : 3

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[3464]-334
B.E. (Computer Engineering)
OPERATING SYSTEMS
(2003 Course)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) What is concurrency in uniprocessor systems? Explain principles of concurrency with example. List four design and management issues handled by O.S. related to concurrency. **[8]**

b) Discuss reader writer problem. Give a solution to reader writer problem using semaphores considering writers have priority. **[8]**

OR

Q2) a) Explain the concept of monitor with neat diagram. Implement a solution to bounded buffer producer/consumer problem using Monitor. **[8]**

b) Explain how mutual exclusion is achieved with hardware support using special machine instructions. State the advantages and disadvantages of using special machine instruction approach. **[8]**

Q3) a) Explain the access matrix structure used for protection domain model. **[10]**

b) State the necessary conditions for deadlock occurrence in a system. Discuss various methods of recovery from deadlock. **[6]**

OR

P.T.O.

Q4) a) The OS contain 3 resources. The number of instances of each resource type are 7,7,10. The current resource allocation state is as shown below: **[8]**

	Allocation			Max		
	A	B	C	A	B	C
P_0	2	2	3	3	6	8
P_1	2	0	3	4	3	3
P_2	1	2	4	3	4	4

i) Is the current allocation is in a safe state.

ii) Can the request made by process P_1 (1,1,0) be granted. Show the stepwise execution.

b) List and briefly explain various program and system threats. Also differentiate in between them. **[8]**

Q5) a) Explain various data structures used by Unix File subsystem and how it supports in implementation of various file system functionalities. **[8]**

b) Explain five typical scenarios for retrieval of a buffer with example and neat diagram for each scenario. **[10]**

OR

Q6) a) State salient features of Unix O.S. Explain in detail various assumptions about hardware. **[8]**

b) Write and explain block read ahead algorithm (breada). **[6]**

c) Draw and explain buffer header structure. **[4]**

SECTION - II

Q7) a) Explain the conversion of byte offset to block number in Unix file system. Explain how Unix allows to create large files, yet keeping inode structure small. **[8]**

b) Differentiate in between Named and Unnamed Pipes. Explain following operations on unnamed pipes in detail. **[10]**

i) Pipe creation.

ii) Reading and Writing to pipe.

iii) Closing pipe.

OR

Q8) a) Explain the structure of a super block and how it speeds up the process of assigning the new inode to a file with example. **[8]**

b) State the mount table fields and explain how the fields are used in mounting operation. Also explain crossing mount points in brief. **[6]**

c) Differentiate in between symbolic link and hard link. **[4]**

Q9) a) In which scenarios kernel saves the context of a process. Explain each scenario in detail. **[8]**

b) Explain in brief following system calls and differentiate between them-

i) fork.

ii) vfork.

iii) execl. **[8]**

OR

Q10) a) Which scheduling strategy is implemented in Unix system. Discuss various scheduling parameters. State and draw various priority levels and explain how kernel calculates the priority of a process state. **[8]**

b) Explain the following terms in brief- **[8]**

i) Orphan process.

ii) Zombie process.

iii) Wait.

iv) Waitpid.

v) System boot and init process.

Q11) a) Explain the terminal driver in canonical and raw mode. **[8]**

b) Write an algorithm for the swapper in Unix and explain the situations when the processes gets swapped in and swapped out. **[8]**

OR

Q12) a) Discuss in detail various data structures involved in Unix demand paging system. **[8]**

b) Streams are schemes for improving modularity of device drivers and protocols. Justify. **[8]**

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[3464] - 335
B.E. (Computer & Information Technology) (Common)
OBJECT ORIENTED MODELING AND DESIGN
(410443) (2003 Course)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:-

1) *Figures to the right indicate full marks.*
2) *Answers to the two sections should be written in separate answer books.*
3) *From Section - I, answer (Q1 or Q2) and (Q3 or Q4) and (Q5 or Q6).*
4) *From Section - II, answer (Q7 or Q8) and (Q9 or Q10) and (Q11 or Q12).*
5) *In design questions you are encouraged to make further suitable assumptions on scope of the systems given wherever felt necessary and do state your important assumptions if any.*

SECTION - I

Q1) Write on the following in brief: **[18]**

a) Inception phase (W.r.t RUP) its importance, scope.
b) Platform Independent Model.
c) Design View in 4 + 1 view of architecture.
d) Object Oriented feature: Encapsulation.
e) Iterations in software development life cycle.
f) Booch Methodology as precursor to UML.

OR

Q2) a) Write short notes on UML profiles (illustrate with examples from web development as a domain to extend UML). **[18]**

b) Illustrate new UML 2.0 features: input and output PINS, manifest.

c) UML 2.0 helps model LARGE and complex systems better. Especially the concepts of packages, REF in sequence and interaction overview diagrams, Illustrate with examples.

Q3) a) Compare and contrast CLASS and COMPONENTS. **[4]**

b) How does one forward engineer an object diagram. Illustrate. **[4]**

c) Give an example WEB application. How is a deployment diagram useful to describe web applications. **[4]**

d) In context of deployment diagrams what are components, Artifacts. **[4]**

OR

P.T.O.

Q4) a) An application has two components. We have defined one Interface called ICompareStrings. There is only one service defined which compares two given strings. The MYSTRINGS component implements the interface. We have a SEARCHBOOKS component that needs to search based on title, author names. The SEARCHBOOKS component can actually reuse the capabilities of comparing strings. Show a fragment of a component diagram showing components and interfaces and various dependencies. **[8]**

b) Explain the following concepts with examples briefly: **[8]**

i) Import in package diagram.

ii) Stubs in package diagrams (Hint: Testing).

Q5) a) What do these terms mean OCL,OCL invariant, ForAll. **[6]**

b) Why does a civil architect model before constructing a house, and why do software developers need to model in UML before constructing software. **[6]**

c) What do you understand by UML goals: executable UML, Extensibility. **[4]**

OR

Q6) a) Consider a software Personal Diary application described below. We can use the diary to manage our daily To-Do tasks, our personal appointments, personal contacts. The application will run on our mobile phone. Add further appropriate assumptions about the scope of the application. Draw a use case diagram for this description using full UML notation for use case diagrams. **[6]**

b) Illustrate through self explanatory diagrams, use of following stereotypes:

i) Extends in use case diagrams. **[6]**

ii) Instantiate in class diagrams.

c) What are structural and behavioral diagrams, list down diagrams in each category. **[4]**

SECTION - II

Q7) a) Draw a class diagram for a Garage system. Make suitable assumptions about scope and working of your Garage (write down the scope too). The garage is for different types of four wheelers. The advanced booking/appointment is done on phone. On the day of appointment as soon as a customer arrives, a job card is created to note all the problems, requirements for the vehicle. An Engineer is assigned based on availability to service a vehicle. On completion of the repair/maintenance/service the engineer prepares a report based on which a Bill is created. The payment is accepted in cash against the bill. Your class diagram must show relevant attributes, methods, relationships. **[10]**

b) How do you show an Exception in a class diagram, give an appropriate example, and give Notation in UML. **[4]**

c) How do you implement an association relationship in C++. **[4]**

OR

Q8) a) What is a derived attribute, class scope variable and how to model them in class diagram. **[4]**

b) Describe a technique for identifying classes/objects in a system. **[4]**

c) Draw a class diagram for system described here. Make suitable assumptions about the scope. An Editor has to be implemented in C++ or java. The documents to be edited will be organized as sentences and words forming the sentence. For each word we would like to keep information on font, color. There has to be a class that helps apply the editing changes and style (font, color) changes to the text.

The user can interact with the editor in a small GUI window to give a search term which the editor has to locate in the text and highlight.

And draw classes, attributes, operations, and relationships between classes. Show which classes are entity, controller, GUI classes. **[10]**

Q9) a) Draw an ACTIVITY diagram for a system process described below. A college has different student associations like sports, literary, science club etc. A student can login to college website, look at the various available associations, and choose one of them to join. All the associations expect you to be a valid student first. The joining process could be different for different associations for example sports association expects you to undergo a fitness test too. The associations organize various events. A member can register for the event online for free. Nonmembers need to pay nominal fees by credit card to register and in either case one gets a confirmation of registration of event. The registrations information needs to be passed onto the activity that sends the email confirmations. **[10]**

b) Compare "join and merge" versus "fork and join" with a good example. **[6]**

OR

Q10) Draw neat fragments on one of the (/interaction overview/state/activity) diagrams to represent the following. Explain the concept too: **[16]**

a) Concurrent sub states and sequential sub states.

b) Activity with actions and parameter node.

c) Working of a traffic signal with help of a timing diagram.

d) Precondition and postcondition in an activity diagram.

*Q11)*a) In the context of sequence diagrams show how to model the following concepts with meaningful examples: **[8]**

i) A parallel frame.

ii) An iteration like a do while loop.

b) Compare, with examples from UML to differentiate the concepts: **[8]**

i) Synchronous and asynchronous call.

ii) ALT and OPT.

OR

*Q12)*a) Consider a Use Case "Take backup of machine data". The possible actor in the system is machine owner. The owner interacts with the application to choose the directories to be backed up. The application then proceeds to take back up of directories one by one. The files in the chosen directories are also backed up one by one. For each file a decision is taken to backup only if file has changed from last backup time. The status of the file change is maintained for each file separately. Once the backup is completed a report is shown to the user about the number of files backed up, total time taken etc. A log of all the backup activities is maintained for reference in future. Please make additional assumptions if relevant and appropriate. Identify classes, actors and model a SEQUENCE diagram for above system with best use of UML Notation. **[8]**

b) Draw a simple COMMUNICATION diagram fragment to show that a communication diagram can show message nesting, show the nature of link between objects (Hint global). **[4]**

c) In the context of interaction diagrams with examples: explain the concept of **[4]**

i) signal.

ii) transient objects.

Total No. of Questions :12] [Total No. of Pages : 6

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[3464]-336

B.E. (Computer Engineering)

PRINCIPLES OF COMPILER DESIGN

(2003 Course)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) *Answers to the two sections should be written in separate books.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Figures to the right indicate full marks.*
4) *Your answers will be valued as a whole.*
5) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) What do you meant by analysis and synthesis of a source program? What phases are involved in carrying out these tasks? Explain in brief with suitable example source language statement or construct. **[8]**

b) Explain with suitable example regular expressions, the meaning of following special symbols in LEX that are used to specify tokens. Write the pattern that is identified by your regular expressions. **[8]**

'/', '\', '{}', '?', '.', '[]', '^', '$'.

OR

Q2) a) Write LEX specifications to identify tokens such as identifiers (keywords and user defined names), constants (signed or unsigned integer and floating point numbers), punctuation symbols, white spaces, arithmetic, logical, relational, assignment operators, comments etc that may appear in a given source program in C. Write necessary code to enter user-defined names in a symbol table if not already entered in the symbol table. The Lex program would write the given source program in a text file with line numbers. Also every lowercase character that appears within a comment will be converted to uppercase. Assume 'if', 'for', 'else', 'int', 'float' are the keywords. **[10]**

b) Construct a DFA for the regular expression you wrote in Q 2 (a) above that identifies floating point numbers. **[6]**

P.T.O.

Q3) a) Consider the following grammar : **[10]**

Lexp → atom | list

atom → number | id

list → (lexp-seq)

lexp-seq → lexp, lexp-seq | lexp

The symbols lexp, atom, list and lexp-seq are non-terminals while symbols number, id, '(', ')', ', ' are terminal symbols.

i) Construct first and follow sets for the non-terminal symbols.

ii) Construct LL (1) parsing table.

iii) Use error recovery technique to take care of error entries in the parser table.

iv) Show the actions of the LL (1) parser for the following input strings.

(a, (b, (2)), (c))

&

(a, (b, 2), (c)).

b) The top-down recursive descent parser is implemented by writing a separate function for each non-terminal symbol and an auxiliary function to match input tokens. For the following CFG, write pseudo-code for appropriate functions to implement the top-down recursive descent parser. **[8]**

$A \rightarrow (A)\, A \mid \varepsilon$, where symbol A is a non-terminal.

OR

Q4) a) Construct a LALR (1) parser table for the following CFG. **[8]**

D → L : T

L → L, id | id

T → int | real

Symbols D, L and T are non-terminals, and, symbols ':', ', ', 'id', 'real' and 'int' are terminals.

b) Show the actions of the LALR parser that uses the parser table constructed in Q4 (a) above for following input strings. **[4]**

i) int id, id

ii) real id, id

c) With suitable examples, illustrate how YACC resolves various types of conflicts in LALR parsing table. **[6]**

Q5) a) Consider the following code fragments. Generate the three-address code for them. **[10]**

i)
```
switch (a + b)
{
        case 1 : x = x + 1;
        case 2 : y = y + 2;
        case 3 : z = z + 3;
        default : c = c – 1;
}
```

ii)
```
if (a < b)
        while (c > d)
                x = x + y;
else
        do
                p = p + q;
        while (e < = f);
```

b) Write syntax directed translation scheme to generate three-address code for function call and return statements in C. For the following statement in a C program, write the three-address code that will be generated by your scheme. **[6]**

x = fun (y + 2* 3, 0) – 1,

Assume that x and y are integer variables and function 'fun' returns an integer value.

OR

Q6) a) Consider following production rules that provided specifications for increment and decrement operators "++" and "--" operators in C. Write syntax directed scheme for these productions, so as to generate appropriate three-address code. **[8]**

L → id ++

L → ++ id

L → id--

L → --id

b) Generate three address code for the following program fragment, where a and b are integer arrays of sizes 25 × 40 each, and there are four bytes per word. Variables add, i and j are integers and are defined. **[8]**

```
main( )
{
    add = 0; i = j = 1;
    do
    {
        add = add + a [i] [j] * b [j] [i];
        i = i + 1; j = j + 1;
    }
    while (i < = 25 && j < = 40);
}
```

SECTION - II

Q7) a) Draw the stack of activation records for the following Pascal program, showing the control and access links, after the second call to procedure 'C'. Describe how the variable 'X' is accessed from within 'C'. **[8]**

```
Program ACCESS;
Procedure A;
Var  X : integer;
    Procedure B;
        Procedure C;
        Begin
            X : = 2;
            B;
        End;
    Begin
        C;
    End;
Begin
    B;
End;
Begin
    A;
End.
```

b) Write the output of the following C program using following parameter passing methods. **[8]**

i) Call by Value.

ii) Call by Reference.

iii) Call by Value-Result and

iv) Call by Name.

```
# include <stdio.h>
int i = 0;
int j = 0;
void p(int x, int y)
{    x + = 1;
     i + = 1;
     y + = 1;
}
void swap (int x, int y)
{
     x = x + y;
     y = x – y;
     x = x – y;
}
main ( )
{
     int a [2] = {1, 1};
     int b [3] = {1, 2, 0};
     p(a[i], a[i]);
     printf("%d, %d\n", a[0], a[1]);
     swap(j, a[j]);
     printf("%d, %d, %d\n", b[0], b[1], b[2]);
     return 0;
}
```

OR

Q8) a) What is an activation record? Describe the significance of various fields of the activation record with suitable illustrations. **[8]**

b) What do you meant by a procedure parameter? Explain the run-time mechanism needed to provide such a facility. **[8]**

Q9) a) Consider the following three-address code. Draw its DAG representation. Show the DAG after labeling using the Labeling algorithm. **[6]**

t1 = a + b

t2 = c + d

t3 = e – t2

t4 = t1 – t3

b) Generate the target code using the labeled tree you have constructed in Q 9 (a) above. Assume the target machine has two registers r1 and r2. Generate the target code assuming only one register 'r' is available in the target machine. **[10]**

OR

Q10) a) Describe the algorithm to partition three-address code into basic blocks. Write three-address code for the program fragment shown in Q 6 (b) above and show the basic blocks. **[8]**

b) What is peephole optimization? Explain it with suitable illustrations. **[8]**

Q11) a) Consider the following three-address code.

```
B = 1
C = 2
A = B + C
D = A – B
D = C * D
C = B + C
E = A – B
D = B + C
E = E + 1
B = C * D
C = B – D
```

Draw the flow graph and compute 'GEN', 'KILL', 'IN' and 'OUT' sets for each basic block. **[12]**

b) Describe the algorithm for detecting and eliminating induction variables. **[6]**

OR

Q12) a) What are principle sources of code optimization? Explain. **[6]**

b) Consider the following three-address code. Eliminate local common sub expressions using DAG and write optimized three-address code. **[12]**

```
(1)  T1 = 4 * I
     T2 = ADDR (A) – 4
     T3 = T2 [T1]
     T4 = 4 * I
     T5 = ADDR (B) – 4
     T6 = T5 [T4]
     T7 = T3 * T6
     T8 = P + T7
     P = T8
     T9 = I + 1
     I = T9
     If I < = 25 GOTO (1)
```

Total No. of Questions : 12] [Total No. of Pages : 3

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[3464]-338

B.E. (Computer Engineering)

ADVANCED DATABASES

(2003 Course)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates :

1) *Answers to the two sections should be written in separate books.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Figures to the right indicate full marks.*
4) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) Explain in detail intra-query and inter-query parallelism. [6]

b) Describe how following operations can be parallelized.
Selection, Projection, Aggregation. [6]

c) What is data partitioned parallelism? [4]

OR

Q2) a) Explain in detail intra operation parallelism. [6]

b) Describe following partitioning techniques :
Round Robin, Hash partitioning. [6]

c) Explain in brief : Handling of skew. [4]

Q3) a) Explain "data transparency" in distributed databases. [6]

b) Explain : Dead Lock Handling, Availability (with respect to distributed databases). [8]

c) Write short note on LDAP. [4]

OR

Q4) a) Explain concurrency control in distributed databases. [8]

b) Explain : distributed data storage. [6]

c) Discuss following points :
Replication transparency, Location transparency. [4]

Q5) a) Why do we have XML DTDs? What is a well formed XML document? What is a valid XML document? Give an example of XML document that is valid but not well formed, and vice versa. [8]

b) Explain in detail the role of databases in a web based system. [4]

c) What is SOAP? [2]

d) Explain : thin clients and thick clients. [2]

OR

Q6) a) Explain : storage of XML data. [6]

b) What are different tiers in 3-tier architecture? Explain in detail the technologies used for each tier. [8]

c) Explain in brief : XQuery. [2]

SECTION - II

Q7) a) Explain in detail the dimensional data modeling. [8]

b) While analyzing the data, it was found that many tuples have no recorded values for several attributes. Explain how this problem of missing values can be solved? [4]

c) Compare : OLTP and OLAP. [4]

OR

Q8) a) Explain architecture of data warehouse. [4]

b) Explain with suitable example the data smoothing techniques. [6]

c) Write short note : Data cube. [4]

d) What is materialized view? [2]

Q9) a) Explain following clustering methods : Partitioning method, Density based method. [4]

b) What is Bayesian classifier? [4]

c) What is knowledge discovery process? [2]

d) Given following transactional data : [8]

TID	List of item - IDs
T 100	I1, I2, I5
T 200	I2, I4
T 300	I2, I3
T 400	I1, I2, I4
T 500	I1, I3
T 600	I2, I3
T 700	I1, I3
T 800	I1, I2, I3, I5
T 900	I1, I2, I3

Find candidate and frequent item sets using a priori algorithm, where minimum support count is 2.

OR

*Q10)*a) Give K-means algorithm for clustering. How we can make this algorithm scalable? **[6]**

b) Explain : Machine learning, Decision tree. **[6]**

c) What is decision support system? **[2]**

d) Give any four applications of data mining. **[4]**

*Q11)*a) What are drawbacks of page rank algorithm? How these drawbacks are removed? **[6]**

b) Explain following with respect to Ranking using TF - IDF. **[4]**

i) Inverse document frequency.

ii) Stop words.

iii) Proximity of terms.

iv) Term frequency.

c) Explain inverted index with suitable example. **[4]**

d) What are synonyms? **[2]**

OR

*Q12)*a) Explain popularity ranking in detail. **[6]**

b) How is retrieval effectiveness measured? **[6]**

c) What is concept of web crawler? Discuss design of a web crawler. **[4]**

P1011

[3464]-339
B.E. (Computer Engg.)
ARTIFICIAL INTELLIGENCE
(2003 Course)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate books.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Detail the applications of AI with respect to E-Commerce and Medicine. **[8]**

b) Explain the four categories of Production system with example. **[8]**

OR

Q2) a) What is Logic Programming? Briefly explain the PROLOG logic programming system. **[8]**

b) What do you mean by Forward and Backward Chaining Rule systems? Explain. **[8]**

Q3) a) Give the Constraint Satisfaction procedure to solve the following problem, **[10]**

```
  DONALD
+
  GERALD
--------
  ROBERT
```

Where it is known that D = 5. The goal is to figure out the unique arithmetic values of the other letters in the range 0 to 9.

b) Explain AO* algorithm in detail with proper example. **[8]**

OR

Q4) a) Solve the problem using MINIMAX procedure where the branching factor is three and the leaf nodes are in weight sequence,
8 7 2 9 1 6 2 4 1 1 3 5 3 9 2 6 5 2 1 2 3 9 7 2 8 6 4
Justify winning move. Add alpha and beta values to the problem tree and mark out Pruned nodes. Assume the first move as MAX. **[10]**

P.T.O.

b) Give examples and illustrate waiting for Quiescence and Secondary search. **[8]**

Q5) a) What is Unification? Illustrate the Unification algorithm with example. Justify why the following two sentences cannot be unified. **[8]**

i) $p(X) \vee (q(f(X)) \wedge r(Y))$.

ii) $p(X) \vee (q(X) \wedge r(S))$.

b) Explain the algorithm to convert the predicate statement into clause form. **[8]**

OR

Q6) a) Create a script about shopping in a supermarket. **[8]**

b) What are the basic premises on which the Fuzzy logic approach is based? **[4]**

c) Explain Bayes' theorem in brief. **[4]**

SECTION - II

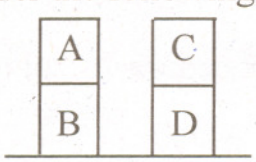
Q7) a) Explain the following type of learning with detail examples, **[8]**

i) Rote ii) Anology.

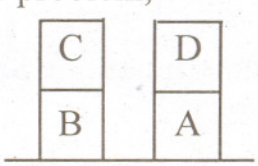
b) What is Nonlinear Planning? Explain in detail. **[8]**

OR

Q8) a) Consider the following blocks world problem, **[8]**



START



GOAL

Represent the start and goal states and solve the problem according to STRIPS.

b) Write notes on Learning by Induction and Learning by Deduction. **[8]**

Q9) a) Write an ATN grammar that recognizes verb phrases involving auxiliary verbs. The Grammar should handle such phrases as, **[10]**

- went
- should have gone
- had been going
- would have been going
- would go

b) Comment on Vision and Speech recognition using AI. **[8]**

OR

*Q10)*a) Explain the role of Navigation and Manipulation contributing to Action. **[8]**

b) Detail the Semantic Analysis phase in NLP. **[10]**

*Q11)*a) Give the possible applications of Neural networks for the following, **[8]**

i) Decision support.

ii) Transaction processing.

iii) Character recognition.

iv) Diagnostics.

b) Draw an ideal architecture of an Expert system. Explain each functional block in detail. **[8]**

OR

*Q12)*a) Explain the Expert systems ELIZA and MYCIN. **[8]**

b) Build a Multilayer Perceptron to solve XOR problem. **[8]**