

COLLEGE OF ENGINEERING PUNE

DEPARTMENT OF COMPUTER ENGINEERING & INFORMATION TECHNOLOGY

End-Semester Examination

(CT-309) Automata Theory

Class & Branch: Third year Information Technology

Semester: I

Duration: 3 hour

Max Marks: 50

Instruction: 1. Assume suitable data if necessary

2. Draw neat diagrams when necessary.

Answer all questions from Part-A.

Answer five questions from Part-B.

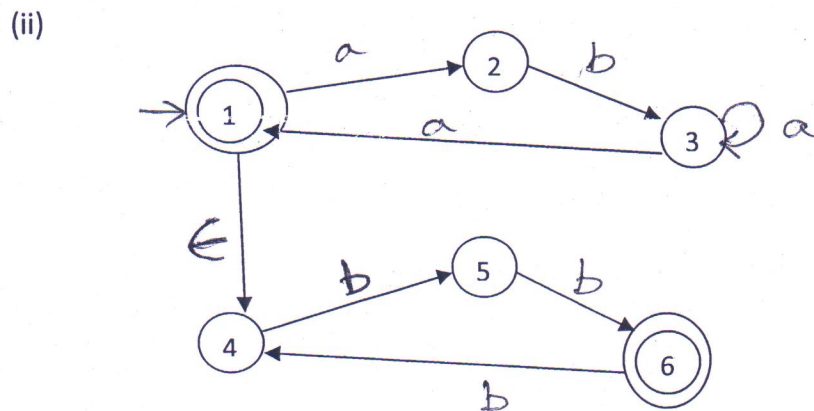
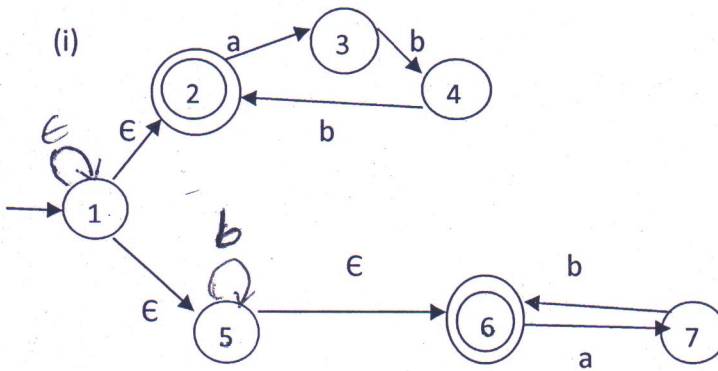
Part A – (5 X 2M = 10M)

1. Explain Church's-Turing Hypothesis.
2. State Pumping Lemma.
3. Give the Closure properties of Context Free Languages.
4. For each of the following regular expression draw a finite automata recognizing the corresponding language
 - (i) $(010 + 00)^* 10$
 - (ii) $(1+10+110)^* 0$
5. Construct a grammar for the following languages
 - a) Set of odd length strings over $\{a, b\}$
 - b) Set of even length strings over $\{a,b\}$

Part-B (5 x 8M = 40M)

6. Construct a CNF for the following grammar
$$S \rightarrow XYaC$$
$$X \rightarrow YC$$
$$Y \rightarrow b|C$$
$$C \rightarrow D|E$$
$$D \rightarrow d$$

7. a) Design a Turing machine accepting the language of odd palindromes over $\{a,b\}$
 b) Construct a push down automata accepting the set of all strings over alphabet $\{a, b\}$ with equal number of a's & b's.
8. a) Design a Turing machine accepting the language of balanced strings of parentheses.
 b) Construct a push down automata accepting $L = \{a^i b^j c^k \mid i, j, k > 0 \text{ and } i=j \text{ or } i=k\}$.
9. Design a mealy machine for binary input sequence; if the sequence ends with 100 the output is 1 otherwise the output is 0. (draw the figure and give the transition table) And convert it into equivalent Moore machine.
10. Find a Griebach Normal Form grammar equivalent to the following CFG.
 $S \rightarrow AA \mid 0$
 $A \rightarrow SS \mid 1$
11. Give a DFA for each of the following NFA with ϵ moves



COLLEGE OF ENGINEERING, PUNE

Computer Engineering and IT Department

Class- T.Y.(InformationTechnology) Exam: End-Sem
Subject: CT311 –System Programming And Operating System

Year – 2011-12

Marks: 50

Time: 3 hrs.

Instructions :-

1. Draw neat figures wherever necessary
2. Assume suitable data wherever necessary

Q.1 A With suitable example explain the following with respect to assembler [4]
1. forward reference resolution 2. Literal Handling

OR

A What are different types of errors an assembler can detect. [4]

B Define the essential properties of the following operating system [4]
i) Batch ii)Real iii)Distributed

C State the difference between system program and system call [2]

Q.2 A Why the segmentation and paging sometimes combined into one [4]
scheme

OR

A List five techniques that can be used in an operating system to [4]
improve the performance of demand paged virtual memory

B Consider the following page reference string. [3]
7 0 1 2 0 3 0 4 2 3 0 3 2 1 2 0 1 7 0 1

Assume 3 frames and pure demand paging How many page fault will
occur for

i)FIFO

ii)LRU

iii)Optimal

C Explain the term a) lazy swapping b) compaction [3]

Q.3 A Define threads. What are the benefits of using threads? [4]

OR

A What is use of open_file, system_wide and pre process table in file [4]
management

B Consider the following set of processes. [4]

Process	Process arrival time	CPU bust time	Priority
P1	0	14	7
P2	1	7	1
P3	3	2	3
P4	5	8	2

PTO

Find the turnaround time, waiting time for each of the following scheduling algorithm.

- i)FCFS
- ii)SJF
- iii)Priority(preemptive)
- iv)Round robin.(Time slice=3ms)

C Draw the process state diagram and explain the contains of PCB (Process Control Block) [2]

Q4 A Consider following snapshot at a particular time. [4]

PROCESS	ALLOCATION				MAX				AVAILABLE			
	A	B	C	D	A	B	C	D	A	B	C	D
P0	0	0	1	2	0	0	1	2	1	5	2	0
P1	1	0	0	0	1	7	5	0				
P2	1	3	5	4	2	3	5	6				
P3	0	6	3	2	0	6	5	2				
P4	0	0	1	4	0	6	5	6				

Answer the following question using banker's algorithm.

- a) What is the content of matrix need?
- b) Is the system is in safe state. if yes find out the safe sequence.
- c) If the request for process P_i arrive for $(0,4,2,0)$ can be granted immediately. If yes then find the sequence.

B What is the purpose of semaphores in critical section problems [4]
OR

B What is the optimistic assumption made in deadlock detection algorithm? How can this assumption are violated. [4]

C What is meant by interprocess communication? How it is achieved. [2]

Q5 A Explain directory structure. [4]

B Explain with suitable example open MPI programming [4]
OR

B Explain classic problem of synchronization [4]

C Write short note on different allocation methods in file system [2]

COLLEGE OF ENGINEERING, PUNE
(An Autonomous Institute Of Government Of Maharashtra)
Department of Computer Engineering & Information Technology
T.Y.B.TECH (I.T.)

Subject: (CT- 312) Human Computer Interaction
End-Semester Examination (2011-12)

Class: T. Y. BTech(I.T.)

Max. Marks: 50

Year: 2011-12

Duration: 3 Hrs.

Instruction

- All questions are compulsory.
- Figure to the right indicates full marks

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- Q.1) A) Explain briefly the 5 phase framework to clarify user interface for textual search. 5
- B) Explain the importance of Information Visualization. Describe various methods used for information visualization. 5
- Q.2) A) Compare direct and indirect control pointing devices. 5
- B) List and explain the basic window interface objects and actions that are common to all system. 5
- Q.3) A) Explain different types of menus. Comment on depth Vs width organization of menu. 5
- B) What are the advantages and disadvantages of online manuals over paper manuals? 5
- Q.4) A) Write a note on:
(i) Ethnographic observation 5
(ii) Speech recognition
- B) Describe different techniques of evaluating an User Interface during its active use. 5
- Q.5) A) How human diversity challenges the developer of interaction system? Explain with example. 5
- B) Explain following user centered design principle with reference to an interface you know
(i) Place the user in control 5
(ii) Reduce a user's memory load

COLLEGE OF ENGINEERING, PUNE

Computer Engineering and IT Department

Class- T.Y. (Information Technology)

Exam: Mid-Sem

Year – 2011-12

Time: 3 hrs.

Subject: CT-310-Data Communication and Networking

Marks: 50

Instructions :-

1. Q.No.1 is compulsory and from Q.No.2 to Q.No.6 solve any four.
2. Uses of any electronics devices are strictly prohibited.
3. Use Black or Blue color ink pen only.
4. Assume suitable data whenever necessary.

- Q.1 In figure 1, node A sends message to node B via LAN1, Router R and LAN2. Considering OSI reference model, show and explain the contents of message format and it's processing at each layer of network model.

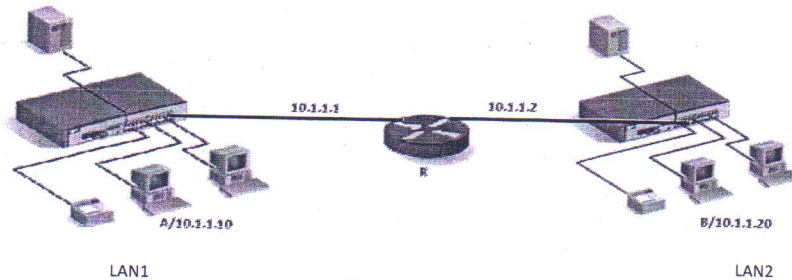


Figure 1

- Q.2 a What is the interleaving in TDM? Draw and explain. How to handle a disparity in the input data rates (If the data rates of all input are not same) in TDM? 5

- b 'In statistical TDM, the capacity of the link is normally less than the sum of the capacities of each channel ' Make your comments.

We need to use synchronous TDM and combine 20 digital sources, each of 100 Kbps. Each output slot carries 2 bit from each digital source, but one extra bit is added to each frame for synchronization. Answer the following questions:

- i. What is the size of an output frame in bits? 5
- ii. What is the output frame rate?
- iii. What is the output data rate?
- iv. What is the efficiency of the system (ratio of useful bits to the total bits).

- Q.3 a What is the purpose of cladding in an optical fiber? Compare and contrast Radio waves, Microwaves and Infrared with respect to their applications in communication. 5

- b We need a three-stage space-division switch with $N = 100$. We use 10 crossbars at the first and third stages and 4 crossbars at the middle stage.

- i. Draw the configuration diagram.
- ii. Calculate the total number of crosspoints.
- iii. Find the possible number of simultaneous connections. 5
- iv. Find the possible number of simultaneous connections if we use one single crossbar (100 x 100).
- v. Find the blocking factor, the ratio of the number of connections in iii and in iv.

- Q.4 a Given the dataword 1010011110 and the divisor 10111,
i. Show the generation of the codeword at the sender site (using binary and polynomial division). 5
ii. Show the checking of the codeword at the receiver site (assume no error).

- b Construct the Hamming code for the bit sequence 1001101 which is send by sender machine A. Now Imagine that by the time the above transmission is received by Receiver Machine B, the number 7th bit of Hamming code has changed from 1 to 0. Find the Error detection using Hamming code 5

- Q.5 a Define piggybacking and its usefulness. Using 5-bit sequence numbers, what is the maximum size of the send and receive windows for each of the following protocols? 5
i. Stop-and-Wait ARQ
ii. Go-Back-NARQ
iii. Selective-Repeat ARQ

- b What are three sets of protocols are defined to make PPP powerful? What are three categories of LCP packets? Can Challenge Handshake Authentication Protocol (CHAP) provides greater security than PAP? Justify your answer. 5

- Q.6 a How to allocate the multi-access channel among competing users? Do we need a multiple access protocol when we use the local loop of the telephone company to access the Internet? Why? 5

- b What should a station do if the channel is busy? And what should a station do if the channel is idle? 5

COLLEGE OF ENGINEERING, PUNE

(An Autonomous Institute of Govt. of Maharashtra)

End-Semester Examination

CT 303: DATABASE MANAGEMENT SYSTEM

Class: - T.Y. B.Tech (Computer Engineering. & Information Technology)

Year: - 2011-12

Semester: - I

Duration: - 3 hrs.

Max. Marks: - 50

Instructions:

1. **Attempt any Five (5) Questions.**
 2. **Assume suitable data whenever necessary.**
 3. **Draw neat figures wherever required**
 4. **Figures to right indicate full marks**
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- Q.1 A) A university registrar's office maintains data about the following [6]
entities: (a) courses, including number, title, credits, syllabus, and prerequisites; (b) course offerings, including course number, year, semester, section number, instructor(s), timings, and classroom; (c) students, including student-id, name, and program; and (d) instructors, including identification number, name, department, and title. Further, the enrollment of students in courses and grades awarded to students in each course they are enrolled for must be appropriately modeled.
- Construct an E-R diagram for the registrar's office. Explain all assumptions that you make about the mapping constraints.
- B) What is the difference between a candidate key and the primary key [4]
for a given relation? What is a superkey? Explain with help of suitable examples.
- Q.2. A) Consider the following insurance database, where the primary keys [5]
are underlined. Construct the following SQL queries for this relational database.

person (driver-id, name, address)

car (license, model, year)

accident (report-number, date, location)

owns (driver-id, license)

participated (driver-id, car, report-number, damage-amount)

- a. Find the total number of people who owned cars that were

involved in accidents in 1989.

b. Find the number of accidents in which the cars belonging to “John Smith” were involved.

c. Add a new accident to the database; assume any values for required attributes.

d. Delete the Mazda belonging to “John Smith”.

e. Update the damage amount for the car with license number “AABB2000” in the accident with report number “AR2197” to \$3000.

- B) Consider the following query: Find the names of sailors with a higher rating than all sailors with age < 21. The following two SQL queries attempt to obtain the answer to this question. Do they both compute the result? If not, explain why. Under what conditions would they compute the same result? [5]

sid	sname	rating	age
18	jones	3	30.0
41	jonah	6	56
22	ahab	7	44
63	moby	null	15

An Instance of Sailors

- a. SELECT S.sname
FROM
Sailors S
WHERE NOT EXISTS (SELECT * FROM Sailors S2
WHERE S2.age < 21
AND S.rating <= S2.rating)
- b. SELECT *
FROM Sailors S
WHERE S.rating > ANY (SELECT S2.rating
FROM Sailors S2
WHERE S2.age < 21)

- Q.3. A) Referential-integrity constraints as defined involve exactly two relations. Consider a database that includes the following relations: [4]

salariated-worker (name, office, phone, salary)

hourly-worker (name, hourly-wage)

address (name, street, city)

Suppose that we wish to require that every name that appears in address appear in either salaried-worker or hourly-worker, but not necessarily in both.

- a. Propose a syntax for expressing such constraints.
- b. Discuss the actions that the system must take to enforce a constraint of this form.

B) Explain the difference between each of the following: [6]

1. Primary versus secondary indexes.
2. Dense versus sparse indexes.
3. Clustered versus unclustered indexes.

If you were about to create an index on a relation, what considerations would guide your choice with respect to each pair of properties listed above?

Q.4. A) Compute the closure of the following set F of functional dependencies & also calculate Canonical Cover for relation schema R = (A, B, C, D, E).

$A \rightarrow BC$
 $CD \rightarrow E$
 $B \rightarrow D$
 $E \rightarrow A$

[6]

List the candidate keys for R.

(Describe the computation in detail & also list the names of axioms which you have used to achieve that FD in closure set of FD's.)

Q.4. B) Explain B-trees & B+ trees with help of an example. Which one is the most efficient? [4]

Q.5. A) Examine the table shown below : [3]

Staff No.	Branch No.	Branch Address	Name	Position	Hrs/Week
E101	B02	Sun Plaza, Delhi, 110001	Ram	Assistant	16
E101	B04	2/3 UT, Delhi, 110111	Ram	Assistant	9
E122	B02	Sun Plaza, Delhi, 110001	Mohan	Assistant	1
E122	B04	2/3 UT, Delhi, 110111	Mohan	Assistant	10

(i) Why is the table above not in 2NF ?

(ii) Describe the process of normalizing the data shown in the table above to third normal form (3NF).

(iii) Identify the primary and foreign keys in your 3NF relations.

Q.5. B) Justify the following statement with an example: Concurrent execution of transactions is more important when data must be fetched from (slow) disk or when transactions are long, and is less important when data is in memory and transactions are very short. [3]

Q.5. C) Write short notes on (Any 2) [4]

1. Parallel and Distributed Systems
2. Nested Relations
3. Web Enabled Systems

Q.6. A) Describe various types of Crash Recovery techniques. [4]

Q.6. B) Mention the different techniques of concurrency control protocols. [3]
Which technique is best according to you ? Why?

Q.6. C) Consider the following two transactions: [3]

```
T1 : read(A);
      read(B);
      if A = 0 then B := B + 1;
      write(B).
T2 : read(B);
      read(A);
      if B = 0 then A := A + 1;
      write(A).
```

Let the consistency requirement be $A = 0 \vee B = 0$, with $A = B = 0$ the initial values.

a. Show that every serial execution involving these two transactions preserves the consistency of the database.

b. Is there a concurrent execution of T1 and T2 that produces a serializable schedule?