Course Code : MCT 535 AZBY/MS – 18 / 4720

Second Semester Master in Computer Application (CBCS) Examination

THEORY OF AUTOMATA AND FORMAL LANGUAGES

Time : 3 Hours] [Max. Marks : 60

Instructions to Candidates :—

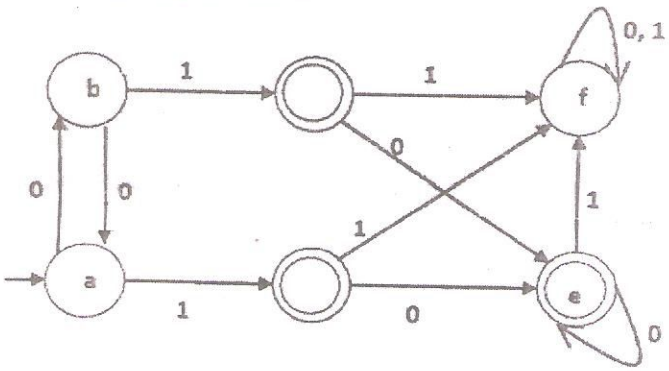
(1) All questions are compulsory.
(2) Illustrate answers with neat figures wherever necessary.
(3) Due credit will be given to neatness.
(4) Assume suitable data wherever necessary.

1. (a) Design a DFA over the alphabet $\Sigma = \{0, 1\}$ to accept following languages :—

(i) Containing set of all strings such that the number of 1's is even and number of 0's is a multiple of 3.

(ii) Containing identical leftmost and rightmost symbol. 4 (CO 1)

(b) Construct a Minimized DFA.



4 (CO 1)

(c) Discuss the concept of ϵ – closure. 2 (CO 1)

2. (a) Obtain the NFA for the regular expression $a(a + b) * b.b$. 2 (CO 1)

(b) Prove using Pumping lemma that following language is not regular

$L = \{a^p b^q c^r \mid p + q \leq r\}$. 4 (CO 1)

(c) For the right linear grammar given below, obtain an equivalent left linear grammar :

$S \longrightarrow 10A \mid 01$

$A \longrightarrow 00A \mid 1$

4 (CO 1)

3. (a) Obtain the CFG for the given languages

(i) $L = \{0^n 1^{2n} \mid n >= 0\}$

(ii) $L = \{\{0, 1\}^* \mid$ no. of 0's = no. of 1's$\}$

4 (CO 2)

(b) Find CNF of the given grammar :

$S \longrightarrow 1A \mid 0B$

$A \longrightarrow 1AA \mid 0S \mid 0$

$B \longrightarrow 0BB \mid 1S \mid 1$

3 (CO 2)

(c) Test whether the following grammar is ambiguous or not :—

$S \longrightarrow AA$

$A \longrightarrow aAb \mid bAa \mid \in$

3 (CO 2)

4. (a) Construct a PDA for the given language : (any **One**)

(i) $L = \{w \in \{a, b\}^* \mid w = \text{reverse}(w)\}$

(ii) $L = \{a^i b^j c^k \mid i = j$ or $k \leq j \leq 2k\}$

6 (CO 2)

(b) Construct a PDA equivalent to following CFG :

$S \longrightarrow aA$

$A \longrightarrow bBA \mid b$

$B \longrightarrow aB \mid a$

4 (CO 2)

5. (a) Design a Turing machine that computes 2's complement of a positive integer, represented in binary form.

6 (CO 3)

(b) Discuss in brief the Halting problem of Turing machine. 2 (CO 3)

(c) Give the relationship between Recursive and recursively enumerable languages. 2 (CO 3)

6. (a) Discuss what is Undecidability ? 2 (CO 4)

(b) Explain briefly what is μ – Recursive function ? 2 (CO 4)

(c) What is Primitive recursive function ? Show that following functions are primitive recursive :

(i) equal $(m, n) = 1$, if $m = n$

$= 0$, otherwise

(ii) abs $(x, y) = |x - y|$ 4 (CO 4)

(d) Prove that PCP with 2 lists $x = (01, 1, 1)$ and $y = (01^2, 10, 1^1)$ has no solution. 2 (CO 4)

Course Code : MCT 536 AZBY/MS – 18 / 4721

Second Semester Master in Computer Application (CBCS) Examination

INTRODUCTION TO OPERATING SYSTEMS

Time : 3 Hours] [Max. Marks : 60

Instructions to Candidates :—

(1) All questions are compulsory.

(2) Due credit will be given to neatness and adequate dimensions.

(3) Assume suitable data and illustrate answers with neat sketches wherever necessary.

1. (a) (i) What is a bootstrap program ? What does it do ?

(ii) Describe in brief how a Direct Memory Access (DMA) structure works. 1·5 X 2 = 3 (CO 1)

(b) Discuss four disk scheduling algorithm with their advantages and disadvantages.

Suppose that a disk drive has 5000 cylinders, numbered from 0 to 4999. The drive is currently serving a request at cylinder 143 and the previous request was at cylinder 125.

The queue of the pending processes, in FIFO order is :

86, 1470, 913, 1774, 948, 1509, 1022, 1750, 130

Starting from the current head position, what is the total distance (in cylinders) that the disk arm moves to satisfy all the pending requests for each of the following disk scheduling algorithms :

(a) FCFS

(b) SSTF

(c) SCAN

(d) C – LOOK. 3 + 4 = 7 (CO 1)

2. (a) The following four processes with their time of arrival (in ms) and CPU Burst Time are given below :

Process	Arrival Time	Burst Time
P1	0	6
P2	1	8
P3	3	7
P4	4	13

With the help of a GANTT Chart, calculate average waiting time, average turnaround time for FCFS, preemptive SJF and Round Robin algorithm. Take quantum $q = 2$ ms. 6 (CO 1)

OR

Discuss the readers writers problem and its possible semaphore based solution. 6 (CO 1)

(b) Discuss the test and set instruction solution to the mutual exclusion problem. 4 (CO 1)

OR

Discuss the compare and swap instruction as a solution to the mutual exclusion problem. 4 (CO 1)

3. (a) Consider a logical address space of 32 pages with 1024 words per page mapped onto a physical memory of 16 frames.

(1) How many bits are required in the logical address ?

(2) How many bits are required in the physical address ? 2 (CO 1)

(b) Explain the use of the following :—

(1) Valid or invalid bit in a page table.

(2) Page Table Base Register (PTBR). 2 (CO 2)

(c) A certain computer provides its users a virtual memory space of 2^{32} bytes. The computer has 2^{18} bytes of physical memory. The virtual memory is implemented by paging and the page size is 4096 bytes. An user generates the virtual address 11123456. Explain how the system establishes the corresponding physical location. 3 (CO 2)

(d) Consider a paging system with the page table stored in memory :

(a) If a memory reference takes 200 nanoseconds, how long does a paged memory reference take ?

(b) If we add TLBs and 75 percent of all page table references are found in the TLBs, what is the effective memory reference time ? (Assume that finding a page table entry in the TLBs takes zero time, if the entry is there). 3 (CO 2)

4. (a) Explain what are safe, unsafe and deadlocked state spaces. 3 (CO 2)

(b) Consider the following snapshot of a system with five processes :—

	Allocation				Max				Available			
	A	B	C	D	A	B	C	D	A	B	C	D
P_0	0	1	1	0	0	2	1	0	1	5	2	0
P_1	1	2	3	1	1	6	5	2				
P_2	1	3	6	5	2	3	6	6				
P_3	0	6	3	2	0	6	5	2				
P_4	0	0	1	4	0	6	5	6				

Answer the following questions using banker's algorithm :—

(a) Find the list of currently available resources.

(b) What is the content of the matrix *Need* ?

(c) Is the system in a safe state ?

(d) If P1 requests (1, 1, 0, 0), can the request be granted immediately ? 4 (CO 2)

(c) Suggest the methods of deadlock recovery. 3 (CO 2)

5. (a) Consider a system in which "computer games" can be played by students only between 10 pm and 6 am., by faculty members between 5 pm and 8 am and by computer center staff at all times. Suggest a scheme for implementing this scheme efficiently. 4 (CO 3)

(b) The assess control matrix can be used to determine whether a process can switch from, say domain A to domain B and enjoy the access privileges of domain B. Is this approach equivalent to including the access privileges of domain B in those of domain A ? 4 (CO 3)

(c) Discuss the strengths and weaknesses of implementing an access matrix using capabilities that are associated with domains. 2 (CO 3)

6. (a) What is the fork() and the exec() system call in Linux ? Describe the relationship between the parent and child processes in Linux. 5 (CO 4)

(b) Discuss the internal layout of the file system in WINDOWS. 5 (CO 4)

Course Code : MCT 537 AZBY/MS – 18 / 4722

Second Semester Master in Computer Application (CBCS) Examination

CONCEPTS IN SOFTWARE ENGINEERING

Time : 3 Hours] [Max. Marks : 60

Instructions to Candidates :—

(1) All questions carry marks as indicated against them.
(2) Illustrate answers with neat sketches wherever necessary.

EITHER

1. (a) Elaborate the generic process framework of a complete software process. Identify and briefly explain the various umbrella activities associated with it. 5 (CO 1)

(b) Explain how function point (FP) can be used as a decomposition technique for Estimation 5 (CO 2)

OR

(c) Which disadvantages of the waterfall model are overcome by the spiral model ? Explain how evolutionary approach can be adapted to apply throughout the life of the computer software. 5 (CO 1)

(d) What are the reasons for late delivery of software ? Explain how Timeline Charts help in managing project schedules. 5 (CO 2)

2. (a) Explain Risk Mitigation, Monitoring and Management (RMMM) strategy adopted for managing risks in software projects. 5 (CO 2)

(b) State and explain the seven distinct requirements engineering tasks. 5 (CO 2)

3. (a) Create a class diagram (at least 5 classes with attributes and methods) showing associations between classes for the scenario given below.
A customer orders products online through a website. The customer regularly visits the website and generally orders similar products. Payment is done through credit card. The system allows the customer to track order. 5 (CO 3)

(b) Which steps are needed to be performed by an analyst in order to create a behavioral model ? Explain each step in brief. 5 (CO 3)

4. (a) Discuss Extreme Programming as an Agile process model. 5 (CO 1)

(b) Explain the method of drawing entity structure diagram in Jackson System of Development. Also represent sequence, selection and iteration in it. 5 (CO 1)

5. (a) Explain the following concepts related with Design Engineering :—

(i) Modularity

(ii) Functional Independence. 6 (CO 1)

(b) Describe the four characteristics of a well formed design classes. 4 (CO 1)

6. (a) Using a flow graph example, elaborate how basis path testing helps in deriving complexity measure of a procedural design ? 5 (CO 4)

(b) (i) What is the significance of Defect Removal Efficiency (DRE) as a quality metric ? Calculate the percentage (DRE) if the pre delivery errors uncovered in a project are 40 and the errors reported by the users are 10.

(ii) Explain how the Formal Technical Review (FTR) helps reduce the latent errors in software engineering process. 5 (CO 4)

Course Code : MCT 538/MCT 516 AZBY/MS – 18 / 4723

Second Semester Master in Computer Application (CBCS) Examination

OBJECT ORIENTED PROGRAMMING - 1

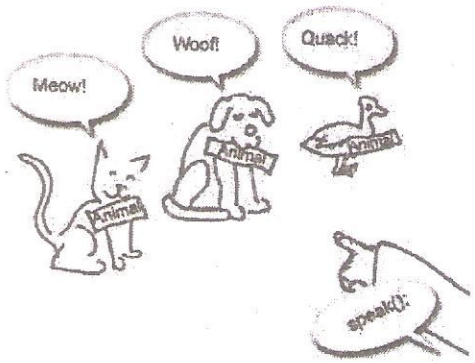
Time : 3 Hours] [Max. Marks : 60

Instructions to Candidates :—

(1) All questions are compulsory.
(2) All questions carry marks as indicated against them.
(3) Assume suitable data and illustrate answers with neat sketches wherever necessary.

1. (a) Differentiate between static binding and dynamic binding. 5 (CO 1)

(b) Identify and explain an OOP concept shown in following diagram.



5 (CO 1)

2. (a) Create functions in C++ to accept two complex numbers and return subtraction using objects. 5 (CO 1)

(b) How will you create the member functions of one class as the friend functions of another class ? Justify with sample code. 5 (CO 1)

3. (a) Write a C++ program to initialize base class members through a derived class constructor. 3 (CO 1)

(b) Explain the following using suitable code :

(i) Runtime Polymorphism

(ii) Multiple Inheritance. 7 (CO 1)

4. (a) How function overloading differs from function overriding ? Discuss with suitable code. 4 (CO 2)

(b) Write a C++ program to create Time class with members hour and minute and functions for input and output. Also design **operator ++()** to increment minute value and return time object. 4 (CO 2)

(c) What do you mean by stream manipulators ? Explain **setfill, setw** and **setprecision** with suitable examples. 2 (CO 2)

5. (a) Create a class Player with data members as playerid, playername, playergame and member functions are getplayer( ), searchplayer( ), and displayplayer( ). Use binary file to store N players information and perform those operations. 6 (CO 3)

(b) Write a C++ program to read and print contents of any text file provided by the user in upper case. 4 (CO 3)

6. (a) What are class templates ? How are they created ? What is the need for class templates ? Create a class template for multiple type parameters. 5 (CO 4)

(b) Write a C++ code to illustrate rethrowing an exception. 3 (CO 4)

(c) Give suitable code for overloading of function templates. 2 (CO 4)