

Rumi Akhtar Khan  
21

**MAULANA AZAD NATIONAL INSTITUTE OF TECHNOLOGY**  
**DEPARTMENT MATHEMATICS**  
**END TERM EXAMINATION NOVEMBER 2017**

Course: MCA

Semester: I

Subject: Mathematics-I

Subject Code: MCA-511

Time: 3 hrs.

Max Marks: 60

**Note: All questions are compulsory.**

1(a) What is graph? Explain Konigsberg bridge problem and its Euler representation by means of a graph. 05

(b) Prove that a tree with  $n$  vertices has  $n-1$  edges. 05

2(a) Prove that in a Boolean algebra the following four statements are equivalent: 05  
 (i)  $a \cdot b' = 0$       (ii)  $a + b = b$       (iii)  $a' + b = 1$       (iv)  $a \cdot b = a$

(b) Define irreflexives, symmetric, anti-symmetric and asymmetric relations. 05  
 Let  $A = \{1, 2, 3, 4\}$ .

Give an example of a relation  $R$  in  $A$  which is:

- (i) neither symmetric nor anti-symmetric.
- (ii) anti-symmetric and reflexive but not transitive.
- (iii) transitive and reflexive but not anti-symmetric.

3(a) Determine the generating function for each of the following discrete numeric functions 05  
 (i)  $2, 5, 13, 35, \dots$       (ii)  $a_r = 5^r + {}^3C_r; r = 0, 1, 2, 3, \dots$

(b) Determine the discrete numeric function corresponding to the following generating functions 05  
 (i)  $\frac{7z^2}{(1-2z)(1+3z)}$       (ii)  $\frac{(1+z)^2}{(1-z)^3}$

4(a) Prove that  $n^{\text{th}}$  is a cyclic group with respect to multiplication. 04

(b) Prove that every subgroup of a finite group is a divisor of the order of the group. 04

(c) Show that  $W = \{(a, 0, 0) : a, b \in R\}$  is a subspace of  $R^3$ . 02

5(a) Show that the mapping  $T : R^2 \rightarrow R^3$  defined by  $T(a, b) = (a-b, b-a, -a)$  is a linear transformation from  $R^2$  into  $R^3$ . Also find the range and nullity of  $T$  05

(b) Find the matrix representation of linear transformation  $T$  on  $R^3$  defined by 05  
 $T(a, b, c) = (a+b, a-2c, b-c)$ .

corresponding to the basis  $B = \{\alpha_1, \alpha_2, \alpha_3\}$ , where  $\alpha_1 = (1, 1, 1)$ ,  $\alpha_2 = (1, 1, 0)$ ,

$\alpha_3 = (1, 0, 0)$ .

6(a) Solve the recurrence relation 05  

$$a_r - 4a_{r-1} + 4a_{r-2} = (r+1)2^r.$$

Solve by the method of generating functions the recurrence relation 05

(b)  $a_r - 5a_{r-1} + 6a_{r-2} = 2, r \geq 2$   
 with the boundary conditions  $a_0 = 1$  and  $a_1 = 2$ .

Name of Student Romi Akhtar KhanRoll Number 21**MAULANA AZAD NATIONAL INSTITUTE OF TECHNOLOGY****DEPARTMENT OF COMPUTER APPLICATIONS****EXAMINATION END TERM MONTH & YEAR NOV-2017**

Course: MCA

Semester: I

Subject Name: Programming through C and C++

Subject Code: MCA-515

Time: 3 Hrs.

Max Marks: 60

NOTE: Answer all questions

Question	Marks
Q1: (a) Explain the different characteristics of top- down approach.	5
Q1: (b) Explain the difference between break and continue by writing a C program to print all prime numbers less than 100.	5
Q2: (a) What do you understand by term storage classes? Describe different storage classes and their applications available in C.	5
Q2: (b) Write a program to display content of a file using command line argument.	5
Q3 (a) Write a program to multiply two 2-D matrix using pointer notations.	5
Q3: (b) What is polymorphism? What are different types of polymorphisms? Explain in details its merits and demerits.	5
Q4: (a) Write a program to copy the string by overloading “=” operator using this pointer.	4
Q4: (b) List down the various types of inheritance supported by C++ using suitable example of each.	6
Q 5 Define a class to represent books in a library, which includes following members: Data Member : Book Number, Book Name, Author, publisher, price, No of copies, No, of copies issued. Member Functions: (i) To assign initial values (ii) To issue a book after checking its availability. (iii) To return a book. (iv) To display book information. (v) To list all books alphabetically.	10
Q6 Write a program to implement class template for using any type of stack. Using the template create different types (char, int, float) of stack.	10

Romi Akhtar Khan

(21)

**MAULANA AZAD NATIONAL INSTITUTE OF TECHNOLOGY BHOPAL**  
**END TERM EXAM (NOV 2017)**

Program : MCA

Semester : **III**

Subject : Computer Organization & Architecture

Subject Code: **MCA-512**

Time : 3.00 hrs.

MM : 60

**Note:** Attempt all the questions..

<b>Q1</b>	(a) What is Counter ? Compare ripple and Synchronous counter. (b) Explain 2's Complement method of subtraction of binary numbers.	05 05
<b>Q2</b>	(a) Write a micro operation to add the contents of two registers and store the sum in third register. The operation will execute when P=1. (b) Draw the schematic diagram of Master Slave JK Flipflop. Explain its working example.	05 05
<b>Q3</b>	(a) Categorize Microoperation. Explain the Shift Microoperation. (b) Explain Sequential Logic Circuits.	05 05
<b>Q4</b>	(a) Explain execution of Instruction cycle with suitable flowchart and examples. (b) Draw and explain bus system for four registers using four full <del>adder</del> circuits. <i>multiplexers</i>	05 05
<b>Q5</b>	(a) Draw a circuit diagram and explain ALU perform microoperations. (b) What is a interrupt? Explain its concept and hardware used.	05 05
<b>Q6</b>	(a) Draw a four bits Combinational circuit shifter and explain its working. (b) Explain Instruction set. Also explain Memory Reference Instruction.	05 05

Name of Student: Romi Akhtar Khan

Scholar No.: 21

**MAULANA AZAD NATIONAL INSTITUTE OF TECHNOLOGY, BHOPAL**  
**END TERM EXAMINATION NOVEMBER 2017**

Course: MCA

Semester: I

Subject: Operating System

Subject Code: MCA-514

Time: 3.00 Hours

Max. Marks: 60

Note: Attempt all questions. All questions carry equal marks.

Q. No.	Questions	Marks																																																																					
Q1 (a)	Explain the concept of Process. Draw a process transition diagram and explain the various process states?	5																																																																					
(b)	How does deadlock avoidance differ from deadlock prevention? Write about deadlock avoidance algorithm in detail.	5																																																																					
Q2 (a)	Give memory partition of 100K,500K,200K,300K and 600K(in order). How would each of the first fit, best fit and worst fit algorithm place process of 212k,417k,112k, and 426k (in order)? Which algorithm makes the most efficient use of memory?	5																																																																					
(b)	Consider a system with five processes P0 through P4 and three resources types A, B, and C. Resources type A has seven instances, resource type B has two instances and resource type C has six instances suppose at time T0 we have the following allocation. <table border="1"> <thead> <tr> <th rowspan="2">Process</th> <th colspan="3">Allocation</th> <th colspan="3">Request</th> <th colspan="3">Available</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> <th>A</th> <th>B</th> <th>C</th> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>P0</td> <td>0</td> <td>1</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>P1</td> <td>2</td> <td>0</td> <td>0</td> <td>2</td> <td>0</td> <td>2</td> <td></td> <td></td> <td></td> </tr> <tr> <td>P2</td> <td>3</td> <td>0</td> <td>3</td> <td>0</td> <td>0</td> <td>0</td> <td></td> <td></td> <td></td> </tr> <tr> <td>P3</td> <td>2</td> <td>1</td> <td>1</td> <td>1</td> <td>0</td> <td>0</td> <td></td> <td></td> <td></td> </tr> <tr> <td>P4</td> <td>0</td> <td>0</td> <td>2</td> <td>0</td> <td>0</td> <td>2</td> <td></td> <td></td> <td></td> </tr> </tbody> </table> If we implement Deadlock detection algorithm we claim that system is in deadlock state or not in deadlock state.	Process	Allocation			Request			Available			A	B	C	A	B	C	A	B	C	P0	0	1	0	0	0	0	0	0	0	P1	2	0	0	2	0	2				P2	3	0	3	0	0	0				P3	2	1	1	1	0	0				P4	0	0	2	0	0	2				5
Process	Allocation			Request			Available																																																																
	A	B	C	A	B	C	A	B	C																																																														
P0	0	1	0	0	0	0	0	0	0																																																														
P1	2	0	0	2	0	2																																																																	
P2	3	0	3	0	0	0																																																																	
P3	2	1	1	1	0	0																																																																	
P4	0	0	2	0	0	2																																																																	
Q3 (a)	Describe following file allocation methods with their relative advantages and disadvantages: i. Contiguous allocation method ii. Linked allocation method iii. Indexed allocation method	5																																																																					
(b)	Give difference between: 1. Multilevel queue and Multilevel feedback queue 2. External fragmentation and Internal fragmentation	5																																																																					
Q4	Write short note on: 1. Belady's Anomaly 2. Thrashing 3. RAID 4. Threads	10 (2.5*4)																																																																					

Q5 (a)	A memory management system has 64 pages with 512 bytes page size. Physical memory consists of 32 page frames. Numbers of bits required in logical and physical address are respectively.	5															
(b)	Consider the virtual page reference string: 7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 1, 2, 0, 1, 7, 0, 1 Suppose a demand paged virtual memory system running on a computer system such that the main memory has 3 page frames. Find out among following page replacement algorithm which has minimum number of page faults? i. FIFO replacement ii. Optimal replacement iii. LRU replacement	5															
Q6 (a)	Consider the disk queue with request for I/O to blocks on cylinders 98, 183, 37, 122, 14, 124, 65, 67. Suppose SSTF and C-SCAN disk scheduling algorithms implemented to meet the requests then the how many total number of head moments if the disk head is initially at 53.	5															
(b)	Consider the following four processes with the arrival time and length of CPU burst given in milliseconds: <table border="1"> <thead> <tr> <th>Process</th> <th>Arrival Time</th> <th>Burst Time</th> </tr> </thead> <tbody> <tr> <td>P1</td> <td>0</td> <td>8</td> </tr> <tr> <td>P2</td> <td>1</td> <td>4</td> </tr> <tr> <td>P3</td> <td>2</td> <td>9</td> </tr> <tr> <td>P4</td> <td>3</td> <td>5</td> </tr> </tbody> </table> Find out average waiting time and turnaround time for preemptive and non preemptive SJF scheduling algorithms.	Process	Arrival Time	Burst Time	P1	0	8	P2	1	4	P3	2	9	P4	3	5	5
Process	Arrival Time	Burst Time															
P1	0	8															
P2	1	4															
P3	2	9															
P4	3	5															

Name of the Student: Romi Akhtar Khan

Roll No. (21)

MAULANA AZAD NATIONAL INSTITUTE OF TECHNOLOGY, BHOPAL  
DEPARTMENT OF MATHEMATICS & COMPUTER APPLICATIONS

Examination : End Term Examination

Program: M.C.A.

Subject: Data Structure

Time: 180 Minutes

Note: All questions are compulsory.

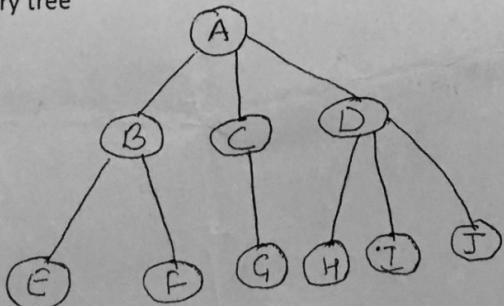
Month & Year : Nov 2017

Semester : I

Sub. Code: MCA-513

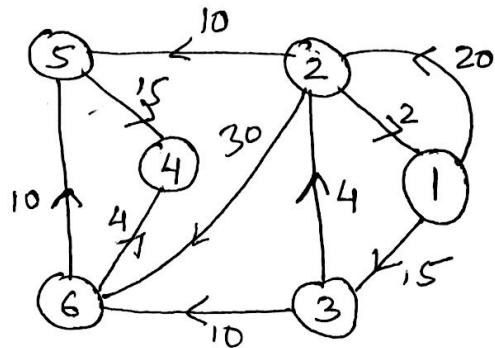
Max. Marks: 60

- Q 1 a) How Single and Multidimensional array are organized in memory? Give the mathematical formula for the said organization. 02
- b) Convert the following infix notation to postfix and prefix notation 03
- (A+B) \*D +E/(F+A\*D)+C
  - A/B\*\*C+D\*E-A\*C
- c) What is a stack? Explain the working of Push and Pop algorithms. Three stacks are to be represented in an array. Write an algorithm to add and delete an item from these stacks. Also specify the overflow and underflow conditions. 05
- Q 2 a) What is queue? Write the algorithm for inserting and deleting an element from queue. The queue is organized in such a way that its FRONT is at high end of memory and REAR at low end of the memory. In this case what changes need to be incorporated in add and delete algorithms? 05
- b) Explain the advantage of circular queue over queue with an example. Design a data representation sequentially mapping n queues into an array V(1:m). Represent each queue as circular queue within V. Write the algorithms ADDQ and DELETEQ for this representation. 05
- Q 3 a) What is a link list? Write an algorithm for 05
- Creation of a link list.
  - Searching a node in the link list.
  - Splitting a link list into two link list such that two nodes are in one list and next two nodes are in the second list.
- b) What is a doubly link list? Write an algorithm for 05
- Creation of a doubly link list.
  - Write an algorithm for inserting a node in a doubly link list at first, middle and last place.
- Q 4 a) What is the difference between a general tree and binary tree? How a given tree can be converted into binary tree 05



What is tree traversal? Write algorithm for in order, post order and pre order traversals.

- b) What is graph? Write the difference between graph and network. Represent the following graph using adjacency matrix. 05



Write the algorithm for shortest path algorithm.

- Q 5 a) How bubble sort works? What is the difference between pass and iteration? Write the algorithms for sorting a given list using bubble sort. Depict the steps of the bubble sort algorithm for sorting the following list. 05

80, 25, 32, 11, 14, 60, 45, 53, 39, 96, 1, 92

- b) Write the algorithm for sorting a given list using quick sort. Depict the steps of the quick sort algorithm for sorting the following list. 05

41, 27, 34, 15, 19, 62, 45, 58, 36, 92, 10, 93

- Q 6 a) What is a minimum spanning tree? Write the algorithm for creating a minimum spanning tree from given graph. 04

- b) Write short notes on

1. Threaded Binary Tree
2. Hashing
3. Heighted Balance Tree

06

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Name of Student:

Scholar No. :

**MAULANA AZAD NATIONAL INSTITUTE OF TECHNOLOGY, BHOPAL**  
**PRACTICAL END EXAMINATION NOV - 2017**  
**Semester I**  
**SET-1**

Program: MCA

Branch: MCA

Subject: Programming through C & C++

Sub. Code: MCA--516

Note: Attempt all questions. All questions carry equal marks.

Q. No.	Questions
1.	Write a C program that creates an Employee text file? Records Are empid, empname, designation, qualification, salary, experience, address, city phone?
2.	Create a structure to specify data of customers in a bank. The data to be stored is: Account number, Name, Balance in account. Assume maximum of 200 customers in the bank. (a) Write a function to print the Account number and name of each customer with balance below Rs. 100. (b) If a customer request for withdrawal or deposit, it is given in the form: Acct. no, amount, code (1 for deposit, 0 for withdrawal) Write a program to give a message, "The balance is insufficient for the specified withdrawal".
3.	Write a Program to implement QUEUE operations using Linked Lists.

Name of Student:

ROMI

Scholar No.:

MAULANA AZAD NATIONAL INSTITUTE OF TECHNOLOGY, BHOPAL  
END TERM EXAMINATION APRIL-2018

Program: MCA

Semester: II

Subject: Advanced Computer Architecture

Subject Code: MCA-522

Time: 3.00 Hours

Max. Marks: 60

Note: Attempt all questions.

Q. No.	Questions	Marks																																																												
Q1 (a)	<p>Given a reservation table below.</p> <table border="1"><tr><td></td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td></tr><tr><td>S1</td><td>X</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>X</td></tr><tr><td>S2</td><td></td><td>X</td><td>X</td><td></td><td></td><td></td><td></td><td>X</td><td></td></tr><tr><td>S3</td><td></td><td></td><td></td><td>X</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>S4</td><td></td><td></td><td></td><td></td><td>X</td><td>X</td><td></td><td></td><td></td></tr><tr><td>S5</td><td></td><td></td><td></td><td></td><td></td><td></td><td>X</td><td>X</td><td></td></tr></table> <ol style="list-style-type: none"><li>Find collision vector</li><li>Draw state diagram</li><li>Find simple and greedy cycle</li><li>Find Minimal Average Latency</li></ol>		0	1	2	3	4	5	6	7	8	S1	X								X	S2		X	X					X		S3				X						S4					X	X				S5							X	X		6
	0	1	2	3	4	5	6	7	8																																																					
S1	X								X																																																					
S2		X	X					X																																																						
S3				X																																																										
S4					X	X																																																								
S5							X	X																																																						
(b)	Explain in detail hardware and software parallelism with example?	4																																																												
Q2 (a)	What is vector processing? Explain the working of vector super computers?	5																																																												
(b)	Discuss the evaluation of computer architecture? Also Determine Flynn's classification based on the multiplicity of instruction streams and data streams in a computer system with the neat diagrams?	5																																																												
Q3 (a)	<p>The times (in seconds) of four programs on three computers are given below:</p> <table border="1"><thead><tr><th rowspan="2">Program</th><th colspan="3">Execution Time (in seconds)</th></tr><tr><th>Computer A</th><th>Computer B</th><th>Computer C</th></tr></thead><tbody><tr><td>Program 1</td><td>1</td><td>10</td><td>20</td></tr><tr><td>Program 2</td><td>1000</td><td>100</td><td>20</td></tr><tr><td>Program 3</td><td>500</td><td>1000</td><td>50</td></tr><tr><td>Program 4</td><td>100</td><td>800</td><td>100</td></tr></tbody></table> <p>Assume that 100,000,000 instructions were executed in each of the four programs. Calculate the MIPS rating of each program on each of the three machines. Based on these ratings, can you draw a clear conclusion regarding the relative performance of these computers? Give reason if you find a way to rank them respectively.</p>	Program	Execution Time (in seconds)			Computer A	Computer B	Computer C	Program 1	1	10	20	Program 2	1000	100	20	Program 3	500	1000	50	Program 4	100	800	100	4																																					
Program	Execution Time (in seconds)																																																													
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Program 2	1000	100	20																																																											
Program 3	500	1000	50																																																											
Program 4	100	800	100																																																											

	(b) What is the pipelining? Describe the classification of pipeline system according to the levels of processing? What are the hazards in pipelining? Describe the necessary conditions for the hazards.	6
Q4 (a)	<p>The time delay of the four segments in the pipeline of given figure are as follows :</p> <p><math>t_1 = 50 \text{ ns}</math>, <math>t_2 = 30 \text{ ns}</math>, <math>t_3 = 95 \text{ ns}</math>, and <math>t_4 = 45 \text{ ns}</math>. The interface register delay time <math>t_5 = 5 \text{ ns}</math>.</p> <ul style="list-style-type: none"> <li>(i) How long would it take to add 100 pairs of numbers in the pipeline?</li> <li>(ii) How can we reduce the total time to about one half of the time calculated in part (i)?</li> </ul>	5
(b)	Compare the following modern processor. <ul style="list-style-type: none"> <li>i. Dual Core</li> <li>ii. Core 2 Duo</li> <li>iii. Intel Core i3</li> <li>iv. Intel Core i5</li> <li>v. Intel Core i7</li> </ul>	5
Q5 (a)	What is omega switching network? Explain the diagrammatically an 8*8 Multistage Interconnection Networks uses 2*2 SEs.	5
(b)	How can we partition a program into parallel branches, program modules, micro task or grain to yield to shortest possible execution time explain with the example?	5
Q6 (a)	<p>Distinguish among computer terminologies:</p> <ul style="list-style-type: none"> <li>(i) Serial Processing versus parallel processing</li> <li>(ii) Control flow computers versus data flow computers</li> <li>(iii) Differentiate between linear and non linear processor</li> <li>(iv) CISC and RISC</li> <li>(v) Loosely coupled multiprocessor versus Tightly coupled multiprocessor</li> </ul>	10

**MAULANA AZAD NATIONAL INSTITUTE OF TECHNOLOGY, BHOPAL**  
**Department of Mathematics, Computer applications and Bio-informatics**  
**End -Term Exam – April -2018**  
**MCA Semester-II**

Subject Code: MCA-611

Maximum Marks: 60

Subject: Mathematics-II

Time: 3: 00 Hours

Note: All questions are compulsory.

Q.1(a)	Using Runge-Kutta method of order 4, solve $y'' = y + xy'$ , $y(0) = 1$ , $y'(0)=0$ to find $y(0.2)$ and $y'(0.2)$ .	5																
(b)	Solve the equation $x^3 - 5x^2 - 17x + 20 = 0$ by Graeffe's method, squaring three times.	5																
Q.2(a)	Solve the equations by Crout's (Cholesky's) method: $\begin{aligned} 2x - 6y + 8z &= 24 \\ 5x + 4y - 3z &= 2 \\ 3x + y + 2z &= 16 \end{aligned}$	5																
(b)	Solve the equations by Gauss-Seidal method: $\begin{aligned} 54x + y + z &= 110 \\ 2x + 15y + 6z &= 72 \\ -x + 6y + 27z &= 85 \end{aligned}$	5																
Q.3(a)	Given that <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td><math>\theta</math></td><td><math>0^\circ</math></td><td><math>5^\circ</math></td><td><math>10^\circ</math></td><td><math>15^\circ</math></td><td><math>20^\circ</math></td><td><math>25^\circ</math></td><td><math>30^\circ</math></td></tr> <tr><td><math>\tan\theta</math></td><td>0</td><td>0.0875</td><td>0.1763</td><td>0.2679</td><td>0.3640</td><td>0.4663</td><td>0.5774</td></tr> </table> Using Stirling's formula, find $\tan 16^\circ$ .	$\theta$	$0^\circ$	$5^\circ$	$10^\circ$	$15^\circ$	$20^\circ$	$25^\circ$	$30^\circ$	$\tan\theta$	0	0.0875	0.1763	0.2679	0.3640	0.4663	0.5774	5
$\theta$	$0^\circ$	$5^\circ$	$10^\circ$	$15^\circ$	$20^\circ$	$25^\circ$	$30^\circ$											
$\tan\theta$	0	0.0875	0.1763	0.2679	0.3640	0.4663	0.5774											
(b)	Given $\log_{10} 654 = 2.8156$ , $\log_{10} 658 = 2.8182$ , $\log_{10} 659 = 2.8189$ , $\log_{10} 661 = 2.8202$ , find by using Lagrange's formula, the value of $\log_{10} 656$ .	5																
Q.4(a)	From the following table, find values of $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x = 2.03$ . <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td><math>x:</math></td><td>1.96</td><td>1.98</td><td>2.00</td><td>2.02</td><td>2.04</td></tr> <tr><td><math>y:</math></td><td>0.7825</td><td>0.7739</td><td>0.7651</td><td>0.7563</td><td>0.7473</td></tr> </table>	$x:$	1.96	1.98	2.00	2.02	2.04	$y:$	0.7825	0.7739	0.7651	0.7563	0.7473	5				
$x:$	1.96	1.98	2.00	2.02	2.04													
$y:$	0.7825	0.7739	0.7651	0.7563	0.7473													
(b)	Given that <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td><math>x</math></td><td>4.0</td><td>4.2</td><td>4.4</td><td>4.6</td><td>4.8</td><td>5.0</td><td>5.2</td></tr> <tr><td><math>\log x</math></td><td>1.3863</td><td>1.4351</td><td>1.4816</td><td>1.5261</td><td>1.5686</td><td>1.6094</td><td>1.6487</td></tr> </table> Evaluate $\int_4^{5.2} \log x \, dx$ by (a) Simpson's 1/3 <sup>rd</sup> -rule (b) Weddle's rule	$x$	4.0	4.2	4.4	4.6	4.8	5.0	5.2	$\log x$	1.3863	1.4351	1.4816	1.5261	1.5686	1.6094	1.6487	5
$x$	4.0	4.2	4.4	4.6	4.8	5.0	5.2											
$\log x$	1.3863	1.4351	1.4816	1.5261	1.5686	1.6094	1.6487											
Q.5(a)	Using convolution theorem solve $L^{-1}\left\{\frac{s}{(s^2+1)(s^2+4)}\right\}$	5																

(b)	Solve the following differential equation using Laplace transform $\frac{d^3y}{dt^3} - 3\frac{d^2y}{dt^2} + 3\frac{dy}{dt} - y = t^2 e^t$ $Y(s) = \frac{1}{s^3} - 3\frac{1}{s^2} + 3\frac{1}{s} - \frac{1}{s}$	5
Q.6(a)	Find the Fourier sine transform of $F(x) = \frac{1}{x(x^2 + a^2)}$	5
(b)	Find the Fourier transform of $F(x) = \begin{cases} x &  x  \leq a \\ 0 &  x  \geq a \end{cases}$	5

**MAULANA AZAD NATIONAL INSTITUTE OF TECHNOLOGY, BHOPAL**  
**DEPARTMENT OF MATHEMATICS AND COMPUTER APPLICATIONS**

**Examination : End Term Examination**

**Program: M.C.A.**

**Subject : Theory of Computation**

**Time : 180 Minutes**

**Month & Year : April 2018**

**Semester : II**

**Sub. Code : M.C.A. 525**

**Max. Marks : 60**

**Note:** All questions are Compulsory.

- Q 1**      a) Explain the difference between Deterministic and Non Deterministic Finite Automata. Construct a Deterministic Finite Automata for the language that contains all string of the type  $(a|b)^*abb$  over alphabet  $\{a,b\}$ .      05  
 b) Proved that there exists a DFA for every NDFA. Convert the following NDFA to its equivalent DFA      05

State	c	d
Initial and Final State $q_1$	$q_1, q_2$	$q_2$
$q_2$	$q_3$	$q_1, q_2$
$q_3$	--	$q_3$

- Q 2**      a) Convert the following NDFA with  $\epsilon$  transition to DFA without  $\epsilon$  transition.      05

State	a	b	$\epsilon$
Initial State $q_0$	$q_1$	--	$q_3$
$q_1$	--	$q_2$	$q_0$
$q_2$	--	$q_3$	$q_1$
Final State $q_3$	$q_0$	--	$q_2$

- b) Define Moore Machine. Construct a Moore Machine for residue mod 5 assuming that input is in the form of binary numbers.      05

- Q 3**      a) Define a regular expression. Convert the following DFA to regular expression.      05

State	0	1
Initial and Final State $q_1$	$q_1$	$q_2$
Final State $q_2$	$q_3$	$q_2$
$q_3$	$q_3$	$q_3$

- b) Construct a Deterministic finite automaton for regular expression  $10 + (0+11)0^*1$ .      05

- Q 4**      a) Define Context free grammar. What is ambiguous grammar? Is the following grammar ambiguous  $S \rightarrow +SS|*SS|a$ .      05

- b) Let G be the grammar      05

$$S \rightarrow SS^+ | SS^* | a$$

Consider string  $aa+a^*$

i) Give a leftmost derivation.

ii) Give a rightmost derivation.

iii) Give parse tree for each of the above derivations.

- Q 5      a) Define push down automata. Construct a push down automata for language  $\{a^{2n}b^{4n} \mid n \geq 1\}$ . 05  
b) Construct a equivalent one way Turing machine for two way Turing machine. 05  
Define all equivalent transitions of two way Turing machine for one way Turing machine.
- Q 6      a) Define a Turing Machine. Construct a Turing Machine for the language  $\{0^n 1^n 0^n \mid n \geq 1\}$  05  
b) Write short notes on Universal Turing Machine. Convert the following Turing machine into Turing Machine Code (in the form of {0,1}) 05

$M = (\{q_1, q_2, q_3, q_4, q_5\}, \{a, b, c\}, \{0, 1, B\}, \delta, q_1, B, \{q_2\})$   
 $\delta(q_1, a) = (q_2, 0, R)$   
 $\delta(q_2, a) = (q_2, a, R)$   
 $\delta(q_2, b) = (q_3, 0, R)$   
 $\delta(q_3, b) = (q_3, b, R)$   
 $\delta(q_3, c) = (q_4, 0, R)$   
 $\delta(q_4, c) = (q_4, c, R)$   
 $\delta(q_4, B) = (q_5, B, L)$

Name of Student: ROMI

Scholar No.: 21

MAULANA AZAD NATIONAL INSTITUTE OF TECHNOLOGY, BHOPAL  
END TERM EXAMINATION APRIL - 2018

Program: MCA

Branch: MCA

Subject: Software Engineering

Sub. Code: MCA-523

Time: 3 Hours

Max. Marks: 60

Note: Attempt all questions.

Q. No.	Questions	Marks
Q1.	<p>A. Discuss Spiral model of software life cycle and also discuss how it is suited for building large scale systems.</p> <p>B. Suggest SRS for the given problem and briefly discuss each phase: “ On Line Examination System : This web application provide facility to conduct online examination worldwide. It saves time as it allows number of students to give the exam at a time and displays the result as the test gets over, so no need to wait for the result. It is automatically, generated by the server. Administrator has a privilege to create, modify and delete the test papers and its particular questions. User can register , login and give the test with his specific id , and can see the result as well.</p>	(04) (06)
Q2.	<p>A. Select an appropriate domain for Agile method and explain in detail.</p> <p>B. Describe about modularity in detail and explain its role in structured design.</p> <p>C. What do you understand by Information Hiding. Explain with suitable example.</p>	(04) (04) (02)
Q3.	<p>A. What is meant by the term coupling in the context of software design . Is it true that in a good design, the modules should have low coupling? Why?</p> <p>B. What is cohesion. Also explain degree and types of cohesion.</p> <p>C. Explain the role of Project Planning, Scheduling &amp; Management.</p>	(03) (04) (03)

Q4.	<p>A. Your company creates software for hospital equipment and its best-selling product is used to monitor heart patients. It is an expensive product but hospitals are always happy to pay a high price because of its quality. A new improved version is due to be rolled out in the next 12 months. This new version will save 10 lives a month. As project manager you have identified a number of risks. The key risk is that a major holiday period is due at a critical stage of the project when many staff will be requesting leave. Therefore there is a risk that shortages of staff will cause a delay.</p> <p>Explain THREE appropriate actions that you could take to deal with this risk of possible staff shortages.</p> <p>B. IT project managers can employ a number of management styles. Two such styles are known as “autocratic”, which is often preferable when most of the project staff are new to a project, and “democratic”, where most of the project staff are more experienced and are able to contribute to the decision-making process. Discuss the advantages and disadvantages of each of these styles.</p>	(06)
Q5.	<p>A. Define software validation and software verification. Explain verification and validation concept by considering the following statements:</p> <ul style="list-style-type: none"> <li>i) Are we building the product right.</li> <li>ii) Are we building the right product.</li> </ul> <p>B. Explain the purpose, the role of the users and the project documentation/products that should be used in each of the testing phases of a project listed below</p> <ul style="list-style-type: none"> <li>.(i)Unit testing .</li> <li>(ii)System Testing</li> <li>(iii)Acceptance Testing</li> </ul>	(04) (06)
Q6.	<p>A. Discuss the term “software quality dilemma”. Explain External and Internal characteristics.</p> <p>B. Discuss Boehm and McCall’s quality models.</p> <p>C. Can a program be correct and still not exhibit good quality. Explain.</p>	(04) (04) (02)