CBCS SCHEME

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BCM301

Third Semester B.E./B.Tech. Degree Supplementary Examination, June/July 2024

Mathematics for Computer and Communication Engineering

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Find the Fourier series of $f(x) = \begin{cases} \pi + x & \text{for } -\pi \le x \le 0 \\ \pi - x & \text{for } 0 \le x \le \pi \end{cases}$	6	L2	CO1
	b.	Find the half range, sine seires of $f(x) = x^2$ in $0 \le x \le \pi$.	7	L2	CO1
	c.	Find the constant term and the first harmonics in the Fourier series of f(x) given.	7	L3	CO1

x	0	$\frac{\pi}{3}$	$\frac{2\pi}{3}$	π	$\frac{4\pi}{3}$	$\frac{5\pi}{3}$	2π
f(x)	1.0	1.4	1.9	1.7	1.5	1.2	1.0

OR

Q.2	a.	Obtain the Fourier series for $f(x) = \begin{cases} -k & \text{in } (-\pi, 0) \\ k & \text{in } 0, \pi \end{cases}$. Hence deduce that $\frac{\pi}{4} = 1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \ldots\ldots$	6	L2	CO1
	b.	Find the Half range cosine series of $f(x) = (x-1)^2$ in $0 \le x \le 1$.	7	L2	CO1
	c.	Find the Fourier series upto first harmonics from the following table :	7	L3	CO1

x	0°	60°	120°	180°	240°	300°	360°
y	7.9	7.2	3.6	0.5	0.9	6.8	7.9

		Module – 2			
Q.3	a.	Find the Fourier transform of $f(x) = \begin{cases} 1-\lvert x \rvert & \text{for } \lvert x \rvert \le 1 \\ 0 & \text{for } \lvert x \rvert > 1 \end{cases}$ and hence find the value of $\int_0^\infty \frac{\sin^2 t}{t^2}\, dt$.	6	L2	CO2
	b.	Obtain the Fourier cosine transform of $f(x) = \begin{cases} 4x, & 0 < x < 1 \\ 4 - x, & 1 < x < 4 \\ 0, & x > 4 \end{cases}$	7	L2	CO2
	c.	Solve the difference equation $y_{n+2} - 4y_n = 0$ given that $y_0 = 0$, $y_1 = 2$.	7	L3	CO2
		OR			
Q.4	a.	Find the Fourier sine transform of $f(x) = e^{-\lvert x \rvert}$ and hence evaluate $\int_0^\infty \frac{x \sin mx}{1+x^2}\, dx$, $m > 0$.	6	L2	CO2

	b.	Obtain the Z – transform of Coshnθ and Sinhnθ.	7	L2	CO2
	c.	Obtain the inverse Z – transform of $\frac{4z^2 - 2z}{(z-1)(z-2)^2}$	7	L3	CO2
		Module – 3			
Q.5	a.	Fit a parabola $y = a + bx + cx^2$ for the data :	6	L2	CO3
	b.	In a partially destroyed laboratory record, the lines of regression of y on x and x on y are available as $4x - 5y + 33 = 0$ and $20x - 9y = 107$. Calculate $\bar{x}$, $\bar{y}$ and co-efficient of correlation between x and y.	7	L3	CO3
	c.	Show that θ is the angle between the lines of regression then $\tan\theta = \frac{\sigma_x \sigma_y}{\sigma_x^2 + \sigma_y^2}\left[\frac{1-r^2}{r}\right]$.	7	L2	CO3
		OR			
Q.6	a.	Fit a curve of the form $y = a\,e^{bx}$.	6	L2	CO3
	b.	Find the correlation co-efficient between x and y for the following data and also obtain the regression lines :	7	L2	CO3
	c.	Ten competitors in a beauty contest are ranked by two judges A and B in the following order. Calculate the rank correlation coefficient.	7	L2	CO3
		Module – 4			
Q.7	a.	If the following table represents discrete probability distribution : Find value of K and i) $P(x < 1)$ ii) $P(x \geq -1)$.	6	L2	CO4
	b.	Find the mean and variance of Poisson distribution.	7	L2	CO4
	c.	In a normal distribution 7% of the items are under 35 and 89% of the items are under 63. Find the mean and standard deviation of the distribution. [A(1.48) = 0.43 and A(1.23) = 0.39].	7	L3	CO4
		OR			

x :	0	1	2	3	4
y :	1	1.8	1.3	2.5	2.3

x	0	2	4
y	8.12	10	31.82

x :	1	2	3	4	5
y :	2	5	3	8	7

I.D. number of competitors	1	2	3	4	5	6	7	8	9	10
Judge A	1	6	5	10	3	2	4	9	7	8
Judge B	6	4	9	8	7	2	3	10	5	7

x	-2	-1	0	1	2	3
P(x)	0.1	K	0.2	2K	0.3	K

Q.8	**a.**	Find the value of 'C' such that $f(x) = \begin{cases} x/6 + C & , \ 0 \le x \le 3 \\ 0 & , \ \text{elsewhere} \end{cases}$ is a p.d.f. Also find $P(1 \le x \le 2)$.	**6**	**L2**	**CO4**
	b.	The probability that a pen manufactured by a factory be defective is 1/10. If 12 such pens are manufactured, what is the probability that i) Exactly 2 are defective ii) Atleast 2 are defective iii) None of them are defective.	**7**	**L3**	**CO4**
	c.	The length of a telephone conversation in booth has been an exponential distribution and found on a average to be 5 minutes. Find the probability that a random call made from this booth i) end less than 5 mins ii) between 5 and 10 mins.	**7**	**L3**	**CO4**
		Module – 5			
Q.9	**a.**	Explain the terms : i) Null hypothesis ii) Confidence intervals iii) Type – I and Type – II errors.	**6**	**L2**	**CO5**
	b.	A certain stimulus administered to each of the 12 patients resulted in the following change in blood pressure 5, 2, 8, -1, 3, 0, 6, -2, 1, 5, 0, 4. Can it be concluded that the stimulus will increase the blood pressure? ($t_{0.05}$ for 11 d.f = 2.201).	**7**	**L3**	**CO5**
	c.	Fit a Poisson distribution for the following data and the test goodness of fit given that $\Psi^2_{0.05} = 7.815$ for 3d.f. x: 0, 1, 2, 3, 4 f: 122, 60, 15, 2, 1	**7**	**L2**	**CO5**
		OR			
Q.10	**a.**	The Joint probability distribution of two random variables x and y is x \ y: -4, 2, 7 1: 1/8, 1/4, 1/8 5: 1/4, 1/8, 1/8 Find marginal distribution and $\rho(x, y)$.	**6**	**L2**	**CO5**
	b.	In 324 throws of a die, an odd number turned up 181 times. Is it reasonable to think that the die is unbiased one?	**7**	**L2**	**CO5**
	c.	The number of accidents per day (x) as recorded in a textile industry over a period of 400 days is given below. Test the goodness of fit in respect of Poisson distribution of fit to the given data [$\Psi^2_{0.05} = 9.49$ for 4 d.f]. x: 0, 1, 2, 3, 4, 5 f: 173, 168, 37, 18, 3, 1	**7**	**L3**	**CO5**

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CBCS SCHEME

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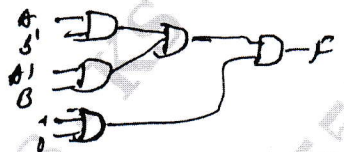
BCS302

Third Semester B.E./B.Tech. Degree Supplementary Examination
June/July 2024
Digital Design and Computer Organization

Time: 3 hrs. Max. Marks: 100

Note: **1.** ***Answer any FIVE full questions, choosing ONE full question from each module.***
2. ***M : Marks , L: Bloom's level , C: Course outcomes.***

		Module – 1	M	L	C
Q.1	a.	Simplify the Boolean function i) $F(x, y, z) = \Sigma(2, 3, 4, 5)$ ii) $F(x, y, z) = \Sigma(3, 4, 6, 7)$	10	L3	CO1
	b.	Obtain a minimum product of sum with a Karnaugh Map $F(w, x, y, z) = x'z' + wyz + w'y'z' + x'y$	10	L3	CO1
		OR			
Q.2	a.	Define multiplexer. Explain 2 to 1 line multiplexer.	10	L2	CO1
	b.	Write the verilog code and time diagram for the given circuit with propagation delay where the AND, OR gate has a delay of 30ns and 10ns.  Fig Q2(b)	5	L2	CO1
	c.	Explain implementation of full adder with logic diagram.	5	L3	CO1
		Module – 2			
Q.3	a.	Explain with neat diagram and 4 input priority encodes.	10	L2	CO2
	b.	Explain 2 : 4 time decoder with help of logic diagram and truth table.	10	L2	CO2
		OR			
Q.4	a.	Define Latch. Explain S-R flip flop based on NOR Gate with neat diagram.	10	L2	CO2
	b.	Explain clocked D flip flop with neat diagram.	10	L2	CO2
		Module – 3			
Q.5	a.	With neat diagram, explain the basic operational concepts of computers.	10	L2	CO3
	b.	Write a program to evaluate arithmetic statement Y = (A + B) * (C + D) using 3 address, 2 address, one address and zero address instruction.	10	L3	CO3
		OR			
Q.6	a.	Describe the concept of Blanch instruction with example.	10	L2	CO3
	b.	Explain 5 addressing modes with example.	10	L2	CO3

		Module – 4			
Q.7	**a.**	Explain the I/O interfacing and I/O device with computers.	**10**	**L2**	**CO4**
	b.	What is Bus Arbitration? Explain types of bus arbitration.	**10**	**L2**	**CO4**
		OR			
Q.8	**a.**	What is cache memory? Explain the different type of cache mapping function.	**10**	**L2**	**CO4**
	b.	Explain basic concepts involved for memory structures of computers.	**10**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	Explain with neat diagram of single bus organization.	**10**	**L2**	**CO5**
	b.	Explain complete execution steps for instruction ADD (R3), R1.	**10**	**L2**	**CO5**
		OR			
Q.10	**a.**	Explain execution of complete instruction carry out.	**10**	**L2**	**CO5**
	b.	What is pipeline? Explain with example of pipeline performance.	**10**	**L2**	**CO5**

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BCS303

Third Semester B.E./B.Tech. Degree Supplementary Examination, June/July 2024

Operating Systems

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Define system call. List the types of system calls.	06	L1	CO1
	b.	With a neat figure, explain the concept of virtual machines.	06	L2	CO1
	c.	Define Operating System. Explain multiprogramming and time sharing operating system.	08	L2	CO1
		OR			
Q.2	a.	List the responsibilities of the operating system for process management and memory management.	06	L1	CO1
	b.	Different between kernel mode and user mode operation of operating systems.	06	L4	CO1
	c.	Discuss the services that are provided by the operating systems for users and its efficient operation.	08	L2	CO1
		Module – 2			
Q.3	a.	Explain the process states with a neat figure.	06	L2	CO2
	b.	Differentiate between the different types of multithreading models.	06	L4	CO2
	c.	Consider the following four processes, with the length of the CPU burst given in milliseconds: Process | Arrival Time | Burst Time P1 | 0 | 8 P2 | 1 | 4 P3 | 2 | 9 P4 | 3 | 5 Computer the average waiting for the above processes using FCFS, Preemptive SJF and non-preemptive SJF scheduling algorithms.	08	L3	CO2
		OR			
Q.4	a.	Define thread. List and explain the benefits of multithreaded programming.	06	L2	CO2
	b.	Differentiate between shared memory and message passing methods for interprocess communication.	06	L4	CO2
	c.	Consider the following set of processes, with the length of the CPU-burst time given in milliseconds: Process | Arrival Time | Burst Time P_1 | 10 | 3 P_2 | 1 | 1 P_3 | 2 | 3 P_4 | 1 | 4 P_5 | 5 | 2 The processes are assumed to have arrived in the under P_1 , P_2 , P_3 , P_4 , P_5 all at time 0. Compute the average waiting time for the above processes using FCFS, Priority (Smaller priority number implies higher priority) and RR (Time quantum = 1) scheduling algorithms.	08	L3	CO2

		Module – 3			
Q.5	**a.**	What is critical section problem? Discuss the three requirements that a solution to critical section problem must satisfy.	**06**	**L2**	**CO3**
	b.	Define semaphore. Explain how mutual exclusion can be implemented using semaphores.	**06**	**L2**	**CO3**
	c.	Consider a system with five processes P_0 through P_4 and three resource type A has ten instances, resource type B was five instances and resource type C has seven instances. Suppose at time 70, the following snapshot of the system has been taken. Determine whether the following system is safe using Banker's algorithm. Write the safe sequence. Allocation / Max / Available A B C / A B C / A B C P_0 0 1 0 / 7 5 3 / 3 3 2 P_1 2 0 0 / 3 2 2 P_2 3 0 2 / 9 0 2 P_3 2 1 1 / 2 2 2 P_4 0 0 2 / 4 3 3	**08**	**L3**	**CO3**
		OR			
Q.6	**a.**	What is deadlock? What are the necessary conditions for a deadlock to occur?	**06**	**L2**	**CO3**
	b.	Illustrate how dining philosophers' problem can be solved using semaphores.	**06**	**L2**	**CO3**
	c.	Give five memory partitions of 100 KB, 500 KB, 200 KB, 300 KB and 600 KB (in order). How would each of the first fit, best fit and worst-fit algorithms place processes of 212 KB, 417KB, 112 KB and 426 KB (in order)? Which algorithm makes the most efficient use of memory?	**08**	**L3**	**CO3**
		Module – 4			
Q.7	**a.**	Explain segmentation with an example.	**06**	**L2**	**CO4**
	b.	Describe the steps in handling a page fault with a neat figure.	**06**	**L2**	**CO4**
	c.	Consider the following reference string 7, 0, 1, 20, 3, 0, 42, 3, 03, 2,1, 2, 0, 1, 7, 0, 1 How many page faults would occur for the following replacement algorithms assuming three frames? (i) FIFO page replacement (ii) LRU page replacement	**08**	**L3**	**CO4**
		OR			
Q.8	**a.**	What is thrashing? How can it be controlled?	**06**	**L2**	**CO4**
	b.	Compare and contrast internal and external fragmentation of memory.	**06**	**L2**	**CO4**
	c.	Consider the following page reference string: 1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6 How many page faults would occur for the following replacement algorithms assuming four frames. i) LRU replacement ii) Optimal replacement	**08**	**L3**	**CO4**

Module – 5					
Q.9	**a.**	Compare and contrast sequential access and direct access methods for extracting information from files.	**06**	**L4**	**CO5**
	b.	Describe the concept of protection domain with an example of a system with three protection domains.	**06**	**L2**	**CO6**
	c.	Suppose that a disk drive has 200 cylinders, numbered 0 to 199. The drive is currently serving a request at cylinder 53, and the previous request was at cylinder 20. The queue of pending requests in FIFO order is 98, 183, 37, 122, 14, 124, 65, 67 Starting from current head position, what is a total distance (in cylinders) that the disk arm move to satisfy all pending requests, for each of the following scheduling algorithms? i) SSTF ii) C-SCAN	**08**	**L3**	**CO5**
OR					
Q.10	**a.**	Differentiate between acyclic-graph directories and tree structured directories.	**06**	**L4**	**CO5**
	b.	Illustrate the concepts of access matrix with suitable examples.	**06**	**L2**	**CO6**
	c.	Suppose that a disk drive has 5000 cylinders, numbered 0 to 4999. The drive is currently serving a request at cylinder 143, and suppose the previous request was at cylinder 125. The queue of pending requests in FIFO order is 86, 1470, 913, 1774, 948, 1509, 1022, 1750, 130. Starting from current head position, what is the total distance (in cylinders) that the disk arm move to satisfy all the pending requests, for each of the following disk scheduling algorithms: i) FCFS ii) SCAN	**08**	**L3**	**CO5**

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BCS304

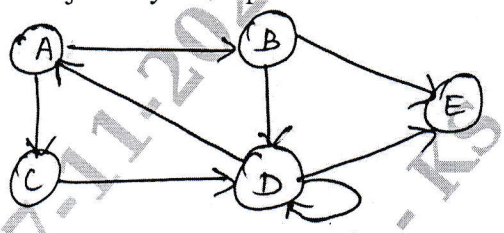
Third Semester B.E./B.Tech. Degree Supplementary Examination, June/July 2024

Data Structures and Applications

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Define Data Structures.	04	L1	CO1
	b.	Explain the classification of Data Structures with example.	10	L2	CO1
	c.	Explain all operations of Data Structures.	06	L2	CO1
		OR			
Q.2	a.	Explain any five string handling functions supported by 'c' with syntax and example.	10	L2	CO1
	b.	Convert the following infix expression to postfix expression using stack: $A + (B * C - (D/E \wedge F) * G) * H$	10	L3	CO1
		Module – 2			
Q.3	a.	List the disadvantages of linear queue and how is it solved in circular queues. Give the algorithm to insert and delete an element in circular queues.	12	L2	CO2
	b.	Explain in detail about multiple queues with relevant functions in 'C'.	08	L2	CO2
		OR			
Q.4	a.	Develop a linked list with the basic operations performed on Singly Linked List (SLL) and different types of linked list.	12	L3	CO2
	b.	Examine a node structure for linked representation of polynomial. Explain algorithm to add two polynomial represented using linked list.	08	L2	CO2
		Module – 3			
Q.5	a.	Summarize Sparse Matrix. For the given sparse matrix, write the diagrammatic linked list representation. $\begin{bmatrix} 8 & 0 & 0 & 0 \\ 5 & 0 & 0 & 3 \\ 0 & 0 & 0 & 0 \\ 4 & 0 & 0 & 8 \\ 0 & 0 & 9 & 1 \end{bmatrix}$	08	L3	CO3
	b.	Define Doubly linked list. Write the functions to perform the following operations on doubly linked list. (i) Insert a node at rear end of the list (ii) Delete a node at rear end of the list (iii) Search a node with a given key value	12	L3	CO3
		OR			
Q.6	a.	Define Tree with any six tree terminology.	06	L1	CO3
	b.	Write the function for copying and testing of binary tree.	06	L3	CO3
	c.	Draw a binary tree and find out the binary tree traversals for the following expression $3 + 4 * (7 - 6)/4 + 3$.	08	L3	CO3

		Module – 4			
Q.7	**a.**	Construct binary search tree for the given set of values 14, 15, 4, 9, 7, 18, 3, 5, 16, 20 Also perform inroder, preorder and post order traversals of the obtained tree.	**08**	**L3**	**CO4**
	b.	Build a linked list representation of disjoint sets in detail.	**06**	**L3**	**CO4**
	c.	Simplify recursive search algorithm for a binary search tree.	**06**	**L3**	**CO4**
		OR			
Q.8	**a.**	Compare a graph with tree. For the graph shown in Fig.Q8(a), show the adjacency matrix and adjacency list representation.  Fig.Q8(a)	**08**	**L3**	**CO4**
	b.	Explain all methods used for traversing a graph with suitable example and write 'C' function for the same.	**12**	**L3**	**CO4**
		Module – 5			
Q.9	**a.**	Differentiate between static hashing and dynamic hashing in detail with operations.	**10**	**L2**	**CO5**
	b.	Describe double ended priority queue.	**04**	**L2**	**CO5**
	c.	Explain Hashing with any three Hash functions.	**06**	**L2**	**CO5**
		OR			
Q.10	**a.**	What is collision? Explain the method to resolve collision with suitable algorithm of linear probing. Insert keys 72, 27, 36, 24, 63, 81, 92, 101 into % [size 10].	**10**	**L3**	**CO5**
	b.	Construct an optimal binary search tree for the following keys with the probabilities as Keys: A, B, C, D, E Probability: 0.25, 0.2, 0.05, 0.2, 0.3	**10**	**L3**	**CO5**

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CBCS SCHEME

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BCS306A

Third Semester B.E./B.Tech. Degree Supplementary Examination, June/July 2024

Object Oriented Programming with Java

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	List and explain OOP's principles in JAVA.	8	L2	CO1

	b.	Class Helloworld {
		Public static void main (String [ ] args) {
		int a ;
		for (a = 0 ; a < 3 ; a + +)
		{
		int b = -1 ;
		system.out.println (" " +b) ;
		b = 50 ;
		system.out.println (" " +b) ;
		}
		system.out.println ("Hello, world!") ;
		}
		}
		What is the output of the above code?
			6	L3	CO1

	c.	Develop a program to find an average among the elements{1, 2, 3, 4, 5} using for each loop in JAVA.	6	L3	CO1
		OR			
Q.2	a.	How arrays are defined and used in Java? Give examples.	6	L2	CO1
	b.	Briefly explain the various primitive data types used in Java.	6	L2	CO1
	c.	Explain the following jump statements : (i) Break (ii) Continue	8	L2	CO1
		Module – 2			
Q.3	a.	Explain the constructor method and parameterized constructors methods with suitable examples.	10	L3	CO2
	b.	Discuss the significant features of the following keyword : (i) this (ii) static	4	L2	CO2
	c.	What is method overloading? Illustrate the concept of method overloading using java program.	6	L2	CO2
		OR			
Q.4	a.	Write a java program to illustrate : (i) Passing object as parameters. (ii) Returning objects	10	L3	CO2
	b.	A class called Employee, which models an employee with an ID, name and salary. The method raiseSalary (percent) increases the salary by the given percentage. Develop the Employee Class and suitable main method for demonstration.	10	L3	CO2

		Module – 3			
Q.5	**a.**	With example, give two uses of super.	**6**	**L2**	**CO3**
	b.	What is dynamic method dispatch? Write a simple example that illustrates dynamic method dispatch.	**8**	**L2**	**CO3**
	c.	Briefly explain the final keyword with inheritance.	**6**	**L2**	**CO3**
		OR			
Q.6	**a.**	What is an interface? Briefly explain the general forms of an interface.	**6**	**L2**	**CO3**
	b.	Discuss the significance of nested interfaces in Java.	**8**	**L2**	**CO3**
	c.	With proper syntax, explain the method overriding.	**6**	**L2**	**CO3**
		Module – 4			
Q.7	**a.**	What is a package? What are the steps involved in creating user defined packages? Explain.	**10**	**L2**	**CO4**
	b.	Define exception and explain the exception handling mechanism with an example.	**6**	**L2**	**CO4**
	c.	Discuss about throw and throws features.	**4**	**L2**	**CO4**
		OR			
Q.8	**a.**	Write a program to illustrate for nested fry statements.	**6**	**L2**	**CO4**
	b.	Enlist any three java Built-in exceptions and explain.	**6**	**L2**	**CO4**
	c.	What is chained exception? Give an example that illustrates the mechanics of handling chained exceptions.	**8**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	Write a program to create multiple threads in JAVA.	**10**	**L3**	**CO5**
	b.	With syntax, explain the use of isAlive ( ) and join ( ) methods.	**6**	**L3**	**CO5**
	c.	Discuss the significance of thread priorities in JAVA.	**4**	**L2**	**CO5**
		OR			
Q.10	**a.**	With Syntax, explain values ( ) and value of ( ) methods.	**6**	**L2**	**CO4**
	b.	List and Discuss the Numeric type wrappers methods.	**6**	**L2**	**CO4**
	c.	Write a program to demonstrate the following : (i) A type wrapper (ii) Autoboxing/Unboxing	**8**	**L2**	**CO4**

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