(1)

Q.P. Code :- 33069

Semester I

(2 ½ Hours) [Total Marks: 75]

N.B. 1) All questions are compulsory.
2) Figures to the right indicate marks.
3) Illustrations, in-depth answers and diagrams will be appreciated.
4) Mixing of sub-questions is not allowed.

Q. 1	**Attempt All (Each of 5Marks)**	**(15M)**
(a)	Select appropriate option from following. 1 Python Array is -- a)Built in data type b) Additional data type **c) Abstract data type** d) Both a&c0 2 What is the worst case for linear search? a) O(nlogn) b) O(logn) **c) O(n)** d) O(1) 3 Process of inserting an element in stack is called _____ a) Create **b) Push** c) Evaluation d) Pop 4 The type of expression in which operator succeeds its operands is? a) Infix Expression b) Prefix Expression **c) Postfix Expression** d) None of the mentioned 5 . In linked list each node contain minimum of two fields. One field is data field to store the data second field is? a) Pointer to character b) Pointer to integer **c) Pointer to node** d) Node	
(b)	Fill in the blanks 1. An ------ is object providing mechanism for general traversal. **Iterator** 2. Queue is called as ------- type of structure. **FIFO** 3. Binary search works only with -------- collection. **Sorted** 4. In a stack, if a user tries to remove an element from empty stack it is called _____. **Underflow** 5. In ------- linked list last node pints to first node. **Circular**	
(c)	Short Answers. 1. State any application where stack can be used. Postfix expression evaluation, solving Maze, Recursion ,Games etc, 2. With reference to Date ADT, what will be the output of statement d=Date() ? Date() constructor creates d as empty object of Date data type. 3. The type of expression used in day today life is following which notation? Operator in between operands called Infix type. 4. What is a hash table? A hash table is used to implement associative arrays which has a key-value pair, so the has table maps keys to values. 5. What is a full binary tree? Each node has exactly zero or two children	

Q. 2	**Attempt the following (Any THREE)(Each of 5Marks)**	**(15M)**
(a)	What is ADT? Explain the types of operation on ADT. Abstract Data Type, define new data values with required operations. Like a black box with data & possible operations. Catag. Of operation: Constructors - Assessors – Mutators - Iterators	
(b)	How to implement array as an ADT? A one dimensional array as collection of contiguously store elements. Constructor Array(size) , length(), getitem(indx), setitem(indx, val), iterator() Expected : def & at least 3 operations.	
(c)	Write note on SET ADT. Definition of set ADT, operations like constructor, intersection, union etc.	
(d)	What is binary search? Explain with example. Based on divide and conquer technique, but basic requirement of sorted data. Example : showing dividing list into 2 , recursive operation ,& limiting search to either left or right side list.	
(e)	Write a program to accept city name from user & display message whether that name exists in predefined list using linear search. ## static list f=1 city=['Kurla', 'CST', Dadar', 'Kalyan', 'Thane'] ct=input('City to search?') for c in city: if c==ct : print(ct,' found in list) f=0 break if f!=0 print(ct,' Not found in list)	
(f)	Arrange this list 5,10,44,20,15 in ascending order by using selection sort. Write down step by step process. Select smallest value 5 store its position compare with first location 0 if locations not same swap. Repeat till last position. Technique reduces swap first selects position & then single swap.	
Q. 3	**Attempt the following (Any THREE) (Each of 5Marks)**	**(15M)**
(a)	What is linked list? Explain types of linked lists. Collection of nodes linked with each other. Define node to hold data & address	

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	part. Then linked list containing node. Operations creating empty list, adding node removing etc. Dig expected. Types Singly – Data & address of next node –unidirectional Doubly – data & address of previous & next node – bidirectional Circular – last node connects with first form circle- traversal from any node.	

(b)	Write a program to implement stack using python list with required functionality.
	class stk:
	def __init__(self):
	self.st=list()
	self.tp = -1
	def push(self,val):
	self.st.insert(0,val)
	self.tp+=1
	def pop(self):
	self.st.pop()
	self.tp-=1
	def disp(self):
	for I in self.st:
	print(i)
	def isEmpty(self):
	
	def size(self):
	##
	s=stk()
	s.push(10); s.push(20);s.disp();s.pop();s.disp()
	*** pop, push & constructor required	

(c)	What is doubly linked list? Define function to append node in doubly linked list. Node with 2 addresses, reference of head & tail. Class node: Def __init__(self): Self.pr=None Self.nx=None Self.data=None Class dblist: Def __init__(self): Self.h=None Self.t=None Def app(self,val): N=node(val) n.pr=self.t self.t=n	

(d)	How stack can be used to check parenthesis balancing? (a+(b-x)+z) Push (Push a Push b Push - push x Pop & match) push + push z pop & match) ** Example of java or c code will do.	
(e)	What is postfix notatin? Convert following expressions to postfix. 1. (a+b)/c 2. a/b*c-d+e 3. a – b/(a+b) 4. a * b *c +d – e	
(f)	Explain the concept of priority queue. By default it is FIFO structure , but some times order can changed by deciding priority of element. Priority number can be assigned to each element & element will be added to queue based on priority number. Higher the priority element placed at the beginning. Bound priority or unbound	
Q. 4	**Attempt the following (Any THREE) (Each of 5Marks)**	**(15)**
(a)	What is recursion? State its properties. Recursion is a process for sovling problems by subdividing a larger problem into smaller cases of problem itself. Iterative operation performed. Properties : A solution must contain base case A recursive solution must contain a recursive case. A recursive solution must make progress towards the base case.	
(b)	With example explain clustering in hashing. As more keys are added more collision will be there , so req linear probing to get next location. So the keys forms cluster. This is primary clustering to over come linear probe can be modified. Example showing hash table with overlapping keys	
(c)	Discuss the steps in quick sort. 1. First key is selected as the pivot – p , using this partition L & G Lwith keys less than p & G with greater 2. Then recursively same algo applied until base case reached 3. The 2 partitions & p values are merged to produced sorted list	
(d)	With respect to tree structure define following terms: Root : First access entry point to tree , Path : the access to other node using edges starting with the root, so the nodes encounter during this is path , Depth : depth of node is distance from root Width : the number of nodes on level ,highest number Height: the number of levels	
(e)	Define recursive function to calculate nth term of Fibonacci series. Test this function to print 10 terms f series. Def fibo(n):	

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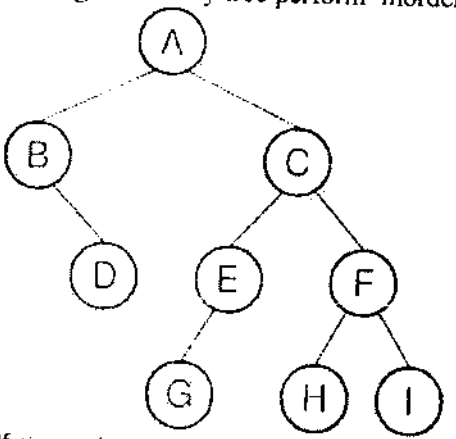
	If n>=1 :
	  if n==1:
	  return 1
	  else:
	  return fibo(n-1)+fibo(n-2)	

(f)	For a given binary tree perform inorder, preorder,and postorder traversal.  If answer is wrong but if procedure is mention correctly give 1 marks atleast. Inorder : **B D A G E C H F I** Preorder : **A B D C E G F H I** Postorder: **D B G E H I F C A**	
Q. 5	**Attempt the following (Any THREE) (Each of 5Marks)**	**(15)**
(a)	Write a program to read 10 numbers and arrange them in descending order using bubble sort.	
(b)	What is list traversal? Explain algorithm for traversing singly linked list. Seting current node to head Visitng next, change current node Repeat till node exists.	
(c)	Write a note on recursive call tree working with runtime stack . Returning call using stack – runtime stack Concept of activation record. For above factorial functionwhen called as fact(3) from main module, stack will have activation record pushed as Main() : return address X As recursive call it will fact(2) so new record pushed is Fact(2): return to main() Fact(1): return to fact(2) & so on When reaches to base case starts poping records from run time stack.& goes back to previous call	
(d)	Build an expression tree for following expressions: 1. a-(b*c+d) 2. (a-c*d)+x/y	
(e)	What is binary search tree? With example insertion of node in this tree. Tree with all less value nodes on left & high value on right results in sorted form	