جامعة كفرالشيخ - كليـــــة الهندسة - قسم الهندسة الكهربية

امتحان نهاية الفصل الاول للعام الجامعي 2017- 2018

الممتحن: د/علي صقر يوم الامتحان : 14 /2018/1

المادة: تصميم الخوارزمات الفرقة 3 حاسبات الدرجة من 90

5M **الاجابة** Fulfill. ilos : a1 , a2 , a3 , a4, C

1- [15M] write an algorithm that search for n elements in a vector of m elements using linear search.

```
For (index= 1, index<=n, index++)
Key= item (index)
For (k= 1, k<=m, k++)
{if ( key= a[k]) break};
```

the expected number of comparisons. = n*m 3M

search for the number 48 .not exist 2M

5M write an insertion algorithms to sort the next numbers, then search for the number 54 after sorting, find number of comparisons.

6	11	12	4	15	7	19	22	23	25	29	3	41	54	5	64

Sorting using insertion algorithms.

6															
6	11														
6	11	12													
4	6	11	12												
4	6	11	12	15											
4	6	7	11	12	15										
4	6	7	11	12	15	19									
4	6	7	11	12	15	19	22								
4	6	7	11	12	15	19	22	23							
4	6	7	11	12	15	19	22	23	25						
4	6	7	11	12	15	19	22	23	25	29					
3	4	6	7	11	12	15	19	22	23	25	29				
3	4	6	7	11	12	15	19	22	23	25	29	41			
3	4	6	7	11	12	15	19	22	23	25	29	41	54		

3	4	5	6	7	11	12	15	19	22	23	25	29	41	54	
3	4	5	6	7	11	12	15	19	22	23	25	29	41	54	64

54 exists at location n-1, number of comparisons O n

fulfill

2- [5M] To compute value of a polynomial, 2 algorithms may be used:

C2, C4

Algorithm1: $p(x) = \Sigma a^i x^i = a_0+a_1x^1+a_2x^2+a_3x^3+\ldots a_{n-1}x^{n-1}+a_nx^n$

Algorithm2: $p(x)= ((\ldots(a_nx+a_{n-1})x+a_{n-2})x+\ldots)x+a_1)x+a_0$

Which algorithm is better, who many operations in each algorithm.

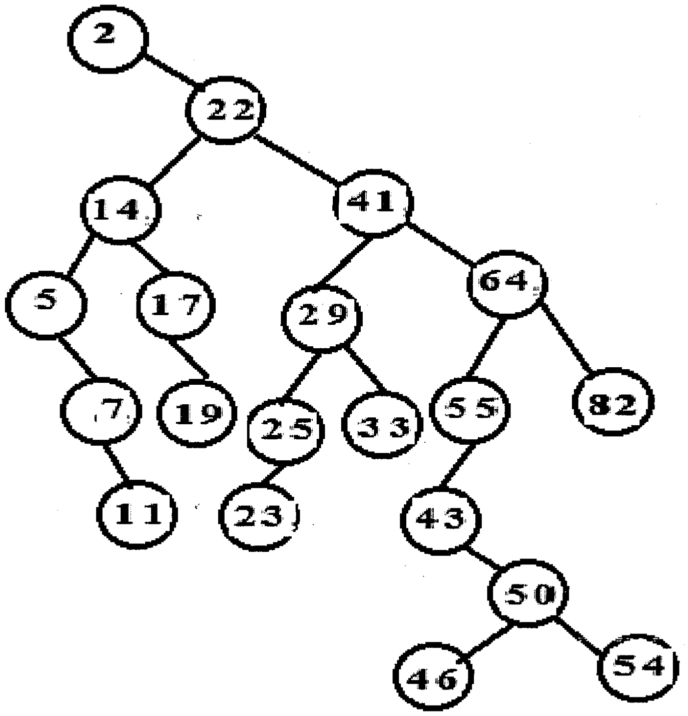
Algorithm 2 is faster, number of multiplications O n, while algorithm 1 necessitates number of multiplications O n^2

3- [15M] Write an algorithm that sorts n elements using **merge** sort algorithm. Apply for the next data, define number of comparisons,

2, 22, 41, 64, 14, 5, 29, 55, 17,7,25, 33, 11, 43, 50, 46, 82, 19, 23, 54

2, 22, 41, 64, 14, 5, 29, 55, 17,7, 25, 33, 11, 43, 50, 46, 82, 19, 23, 54
2,22, 41, 64,5, 14, 29,55, 7,17, 25, 33, 11, 43, 46,50, 19,82, , 23, 54
2,22, 41, 64, 5, 14, 29,55, 7,17, 25, 33, 11, 43, 46,50, 19, 23, 54, 82
2, 5, 14, 22, 29, 41,55, 64, 7, 11,17, 25, 33, 43, 46,50, 19, 23, 54, 82
2, 5, 7, 11,14, 17, 22, 25, 29, 33, 41, 43, 46, 50, 55, 64, 19, 23, 54, 82
2, 5, 7, 11,14, 17, 19,22, 23,25, 29, 33, 41, 43, 46, 50, 54, 55, 64, 82
Number of operations O n log n
construct a binary tree for sorting, compare complexity of the two algorithms.
Number of operations O n log n

fulfill C2, C4,



Using infix scan:

2, 5, 7, 11,14, 17, 19,22, 23,25, 29, 33, 41, 43, 46, 50, 54, 55, 64, 82

4-[5M] **Let string : R= abcdefg56789, reverser= 98765gfedcba,**

S= ABCDEFGHIJKLMNOPQRSTUVWXYZ1234567890,

Write functions to compute: length of S, substring(S, 10,5), index (S, MNO), concatenate (S,R), delete(S, 5,5), insert (S,12,R), replace(S, PQR, reverser),

len (S)= 36

substring(S, 10,5)= JKLMN,

index (S, MNO)= 12,

concatenate (S,R)= ABCDEFGHIJKLMNOPQRSTUVWXYZ1234567890 abcdefg56789,

delete(S, 5,5)= ABCDJKLMNOPQRSTUVWXYZ1234567890,

insert (S,12,R)= ABCDEFGHIJKL abcdefg56789MNOPQRSTUVWXYZ1234567890,

replace(S, PQR, reverser)= ABCDEFGHIJKLMNO98765gfedcba STUVWXYZ1234567890,

5-[10M] Use stack to generate postfix expressions for the next infix expressions: (a*b) ^c - (c-d)*E / (x^y). Use the binary tree to generate the postfix expression.

(5M)
fulfill ds

b	)
a	*
	(

c	
(a*b)	^

	)
d	-
c	(
(a*b) ^ c	-

	)
y	^
x	(
E	/
(c-d)	*
(a*b) ^ c	-

(x ^y)	
E	/
(c-d)	*
(a*b) ^ c	-

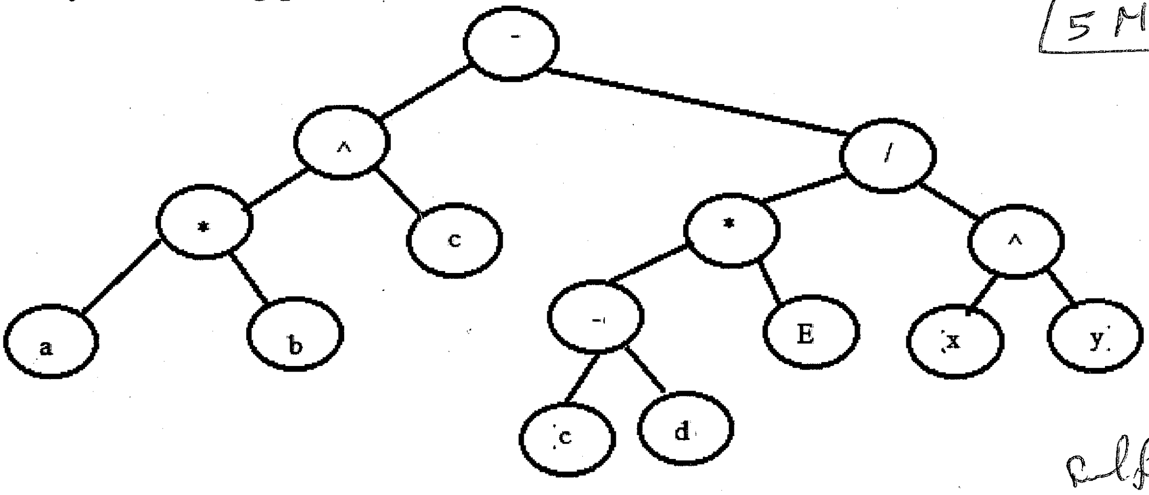
E / (x ^y)	
(c-d)	*
(a*b) ^ c	-

(c-d) * E / (x ^y)	
(a*b) ^ c	-

(a*b) ^ c - (c-d) * E / (x ^y)	

Binary tree: using postfix, reads: a b * c ^ c d - E * x y ^ / -

5 M



6-[15M] Write an algorithm that sorts a vector of n elements, using radix sort technique. Apply for the next data, deduce number of comparisons in each case. Delete the items 15, 54. Find the new linked list. Write the algorithm for deletion.

12, 2, 41, 64, 14, 15, 29, 55, 17, 6, 25, 33, 61, 43, 50, 46, 82, 19, 23, 56

1st (right) digit sorting:

0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
50	41	12	33	64	15	6	17		29
	61	2	43	14	55	46			19
		82	23		25	56			

The pseudo ordered set is
50,41,61, 12,2,82, 33,43,23,64,14,15,55,25,6,46,56,17,29,19

The 2nd digit sorting:

0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
2	12	23	33	41	50	61		82	
6	14	25		43	55	64			
	15	29		46	56				
	17								
	19								

The ordered set is :

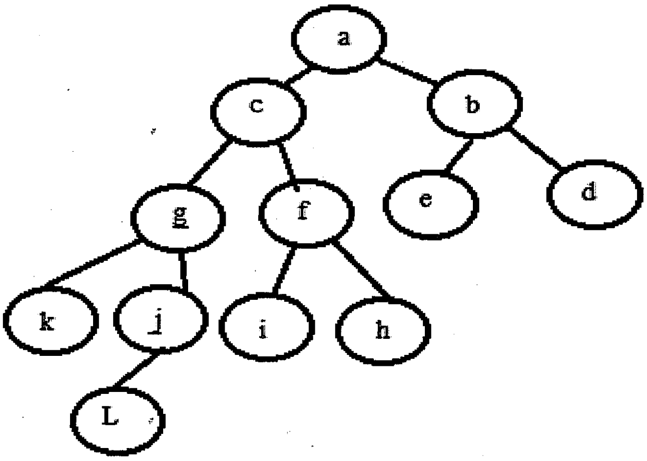
2,6,12,14,15,17,19,23,25,29,33,41,43,46,50,55,56,61,64,82

Use linked list to sort these items:

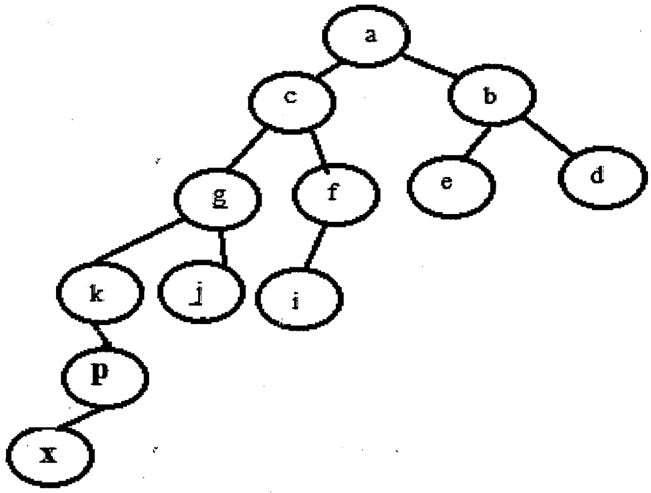
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
12	**2**	**41**	**64**	**14**	**15**	**29**	**55**	**17**	**6**	**25**	**33**	**61**	**43**	**50**	**46**	**82**	**19**	**23**	**56**
5	**S** **10**	**14**	**17**	**6**	**9**	**12**	**20**	**18**	**1**	**7**	**3**	**4**	**16**	**8**	**15**	**0**	**19**	**11**	**13**

7-[10M] construct the next tree, regarding the next double linked list. Write the corresponding algorithm. Traverse the tree using postfix notation. [illegible] b2

	1	2	3	4	5	6	7	8	9	10	11	12
Right	2	4	6	0	0	8	10	0	0	0	0	0
info	a	b	c	d	e	f	g	h	i	j	k	L
left	3	5	7	0	0	9	11	0	0	12	0	0



Delete elements h, L. insert item P to be a right child for item k. P has a left child x, and no right one.



	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Right	2	4	6	0	0	0	10	0	0	0	13	0	0	0
info	a	b	c	d	e	f	g	h	i	j	k	L	p	x
left	3	5	7	0	0	9	11	0	0	0	0	0	14	0

by
C_2

8-[10M] Let a set of tasks to be processed in a FCFS_queue using one server, find the average completion time, average service time, average waiting time, consider front =1, rear= 13 . find number of waiters in queue (queue length).

Task num.	1	2	3	4	5	6	7	8	9	10	11	12	13
Expected execution time	25	22	12	20	2	50	30	10	2	20	40	10	5
waiting	0	25	47	59	79	81	131	161	171	173	193	233	243
completion time	25	47	59	79	81	131	161	171	173	193	233	243	248
Number of waiters	12	11	10	9	8	7	6	5	4	3	2	1	0