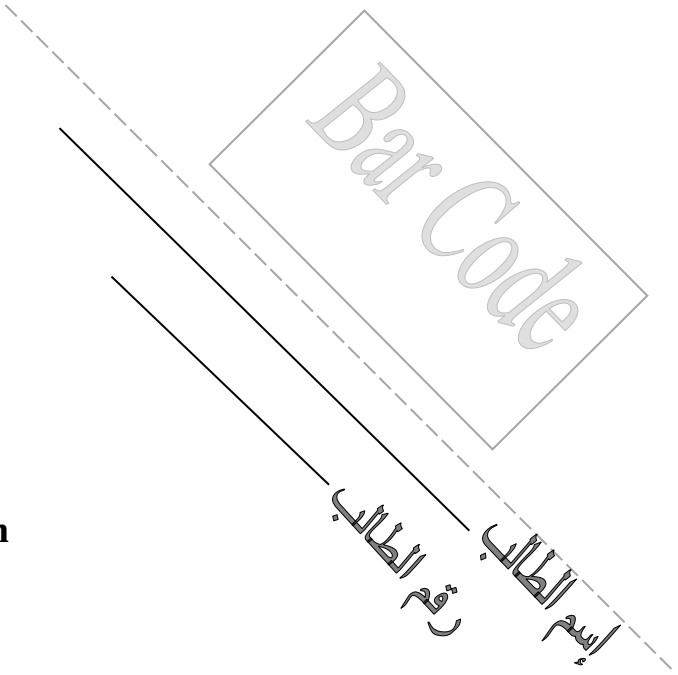


Cairo University
Faculty of Computers and Information

Final Exam

Department: CS

Course Title: Algorithms
Course Code: CS316
Semester: 2
Instructor: Dr- Basheer Abdel Fattah Youssef
Date: 6/6/2016
Exam Duration: 2 Hours

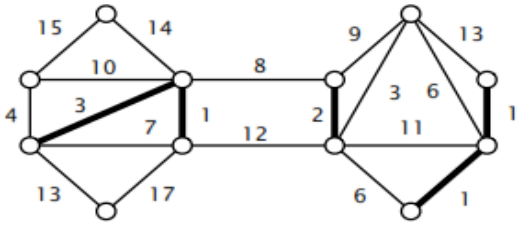
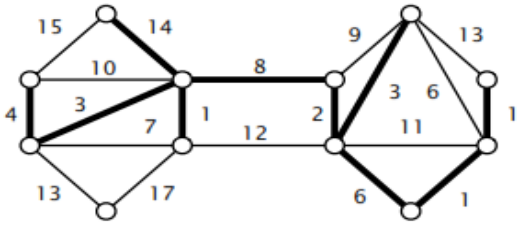
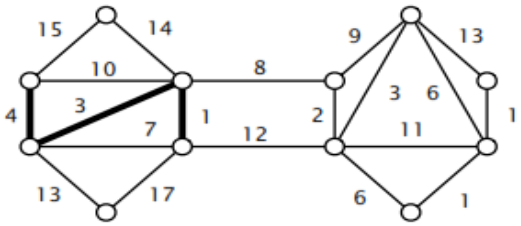
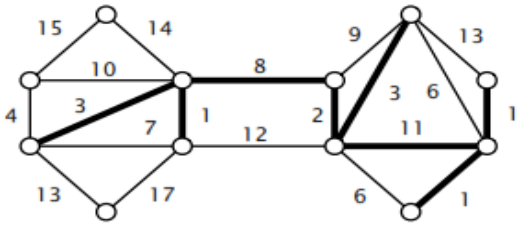
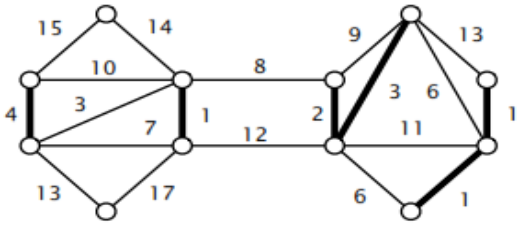
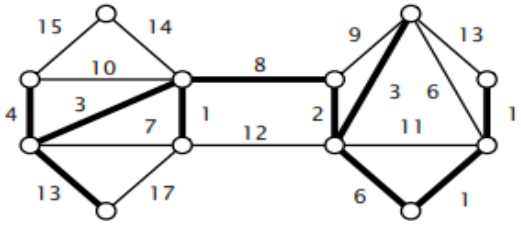
Question	Mark	Signature
One		
Two		
Three		
Four		
Five		
Six		
Seven		
Eight		
Nine		
Ten		
Total Marks		

60

Total Marks in Writing: _____

ممنوع الكتابة فى هذا المكان

Question (1)**Minimum Spanning Tree Algorithms** (12 points)
Each of the figures below represents a partial spanning tree. Determine whether it could possibly be obtained from,Prim's algorithm, Kruskal's algorithm, both or neither.

	PRIM	KRUSKAL	BOTH	NEITHER
	○	○	○	○
	○	○	○	○
	○	○	○	○
	○	○	○	○
	○	○	○	○
	○	○	○	○

***Question* (2) Analysis of Algorithms (10 points)**

For each code fragment on the left, check the best matching order of growth of the running time. You may use an answer more than once or not at all. Explain your selection.

	N	$\log N$	$N \log N$	$R+N$	RN	$N+R^2$	$(N+R)\log N$	$N(N+R)$

`int x = 1, i;`
`for(i = 0; i < N; i++)`
`  x++;`
	O	O	O	O	O	O	O	O

`public static int f2(int N) {`
`  int x = 1;`
`  while(x < N)`
`  x = x * 2;`
`  return x;`
`}`
	O	O	O	O	O	O	O	O

`int x = 0, i;`
`for(i = 0; i < N; i++)`
`  x += f2(N);`
	O	O	O	O	O	O	O	O

`int x = 1, i, j;`
`for(i = 0; i < N; i++)`
`  for(j = 1; j < R; j++)`
`  x = x * j;`
	O	O	O	O	O	O	O	O

`int x = 0, i, j;`
`for(i = 1; i <= N; i++)`
`  for(j = 1; j <= N+R; j+=i)`
`  x += j;`
	O	O	O	O	O	O	O	O

Question (3)- five sorting algorithms (10 points)

The column on the left is the original input of strings to be sorted the column on the right are the strings in sorted order; the other columns are the contents at some intermediate step during one of the algorithms listed below. Match up each algorithm by writing its number under the corresponding column. Use each number exactly once, explain your answer.

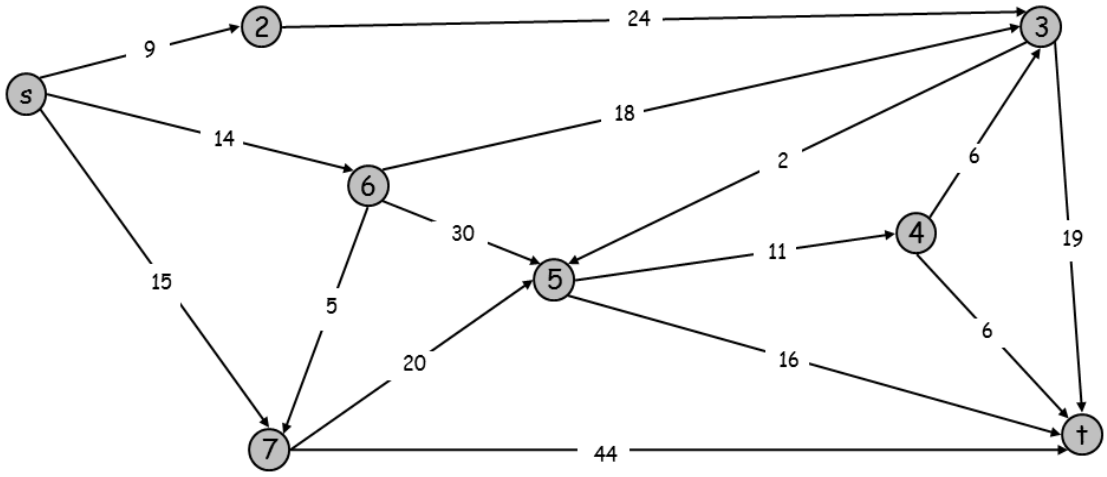
```
0  deer bass bass bear bear bull bass
1  clam bull bear bull bull clam bear
2  bear bear bull calf calf bear bull
3  myna crow calf clam clam bass calf
4  tuna deer clam deer deer crow clam
5  slug clam crab dove dove crab crab
6  dove calf crow gnat lynx calf crow
7  moth dove deer lynx moth deer deer
8  lynx hoki dove moth myna lynx dove
9  bull duck duck myna slug moth duck
10 calf crab gnat pony sole dove gnat
11 sole mule hoki seal tuna sole hoki
12 pony moth pony slug gnat pony lion
13 seal lynx seal sole hoki seal lynx
14 gnat gnat myna swan mule gnat moth
15 swan puma swan tuna pony swan mule
16 mule myna mule mule seal mule myna
17 hoki seal sole hoki swan hoki pony
18 duck lion tuna duck bass duck puma
19 crab sole slug crab crab slug seal
20 crow pony lynx crow crow tuna slug
21 bass tuna moth bass duck myna sole
22 lion slug lion lion lion lion swan
23 puma swan puma puma puma puma tuna
   ---- ---- ---- ---- ---- ---- ----
    0                             1
```

(0) Original input (1) Sorted (2) Selection sort (3) Insertion sort
(4) Shellsort (5) Mergesort (6) Quicksort

Question **(4) insert the following number in a redblack tree (2,1,4,5,9,3,6,7) , show each step and show the color of each node (10 points).**

Question **(5) Find longest common subsequence (LCS) BETWEEN Algorithm and Alignment using daynamic programming Show detailed steps(10 points)**

Question **(6)- Find the shotrest path for the following graph from s to t (10 points)**



Good Luck

Dr Basheer Youssef.