

	<b>FINALTERM EXAMINATION</b> <b>SPRING 2007</b> <b>CS502 - FUNDAMENTALS OF ALGORITHMS (Session</b> <b>- 5 )</b>	Marks: 50 Time: 150min
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Student Name: \_\_\_\_\_

Center Name/Code: \_\_\_\_\_

Exam Date: Thursday, July 05, 2007

### INSTRUCTIONS

**Please read the following instructions carefully before attempting any of the questions:**

1. Attempt all questions. Marks are written adjacent to each question
2. Paste the bitmap image for the tables, diagrams etc while solving your questions
3. This examination is closed book, closed notes, closed neighbors.
4. Do not ask any questions about the contents of this examination from anyone.
  - a. If you think that there is something wrong with any of the questions, attempt it to the best of your understanding.
  - b. If you believe that some essential piece of information is missing, make an appropriate assumption and use it to solve the problem.
5. Some of the examination consists of multiple-choice questions. Choose only one choice as your answer.
6. Write all steps, missing steps may lead to deduction of marks
7. Use of cell phone during the examination is strictly prohibited, otherwise strict disciplinary action will be taken as per university rules

**\*\*WARNING: Please note that Virtual University takes serious action against unfair means. Anyone found involved in cheating will get an `F` grade in this course.**

For Teacher's use only											
Question	1	2	3	4	5	6	7	8	9	10	Total
Marks											

The recurrence relation of Tower of Hanoi is given below

$$T(n) = \begin{cases} 1 & \text{if } n=1 \\ 2T(n-1)+1 & \text{if } n>1 \end{cases}$$

In order to move a tower of 6 rings from one peg to another, how many moves are required?

- ▶ 15
- ▶ 7
- ▶ 63
- ▶ 32

Question No: 2 ( Marks: 1 ) - Please choose one

Edge (u, v) is a forward edge if

- ▶ u is a proper descendant of v in the tree
- ▶ v is a proper descendant of u in the tree
- ▶ None of these

Question No: 3 ( Marks: 1 ) - Please choose one

Is  $2^{2n} = O(2^n)$ ?

- ▶ Yes it is possible
- ▶ No it is not possible
- ▶ None of these

Question No: 4 ( Marks: 1 ) - Please choose one

If, in a DFS forest of digraph  $G = (V, E)$ ,  $f[u] \leq f[v]$  for an edge  $(u, v) \in E$  then the edge is called

- ▶ Back edge
- ▶ Forward edge
- ▶ Cross Edge
- ▶ Tree Edge
- ▶ None of these

Question No: 5 ( Marks: 1 ) - Please choose one

How can the number of strongly connected components of a graph change if a new edge is added?

- ▶ The number of strongly connected components can be increased.
- ▶ The number of strongly connected components can be reduced.
- ▶ No change will occur.
- ▶ None of these.

**Question No: 6 ( Marks: 10 )**

Complete the following instance of the optimal matrix multiplication ordering problem.  
Also give the optimal multiplication order.

$p[0]=5$        $p[1]=4$        $p[2]=3$        $p[3]=4$        $p[4]=5$   
 $p[5]=6$

	1	K	2	K	3	K	4	K	5	k
1	0	0	60	1	120	2	195	2	?	?
2			0	0	48	2	120	2	222	2
3					0	0	60	3	150	4
4							0	0	120	4
5									0	0

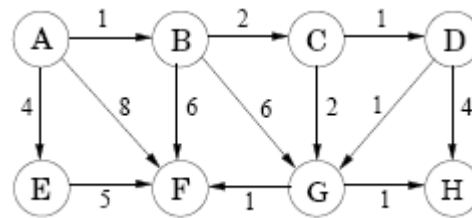
**Question No: 7 ( Marks: 10 )**

For the following given comparison, what are the tradeoffs between adjacency lists and adjacency matrices?

Comparison	Winner
Faster to test if (x, y) exists.	?
Faster to find vertex degree?	?
Less memory on small graphs?	?
Less memory on big graphs?	?
Edge insertion or deletion?	?
Faster to traverse the graph?	?
Better for most problems?	?

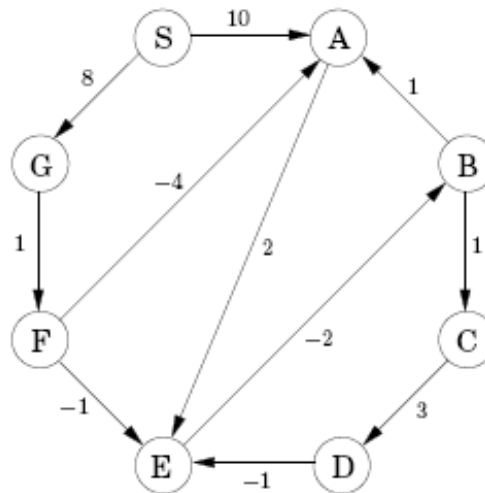
**Question No: 8 ( Marks: 10 )**

Run Dijkstra's algorithm on the following graph, starting at node A. Show all the intermediate values.



Question No: 9 ( Marks: 10 )

Apply Bellman-Ford Algorithm on the following graph. Show values after each iteration in a tabular form. S is the starting node.



Question No: 10 ( Marks: 5 )

Show the linear ordering of vertices produced by TOPOLOGICAL-SORT when it is run on the following DAG

