

**Course No:** IGGC3208, ESGD5204  
**Course Title:** Advanced Database  
**Date:** 29 / 05 / 2013  
**No. of Questions:** 5 Questions  
**Time:** 2 hours  
**Using Calculator (Yes)**

**University of Palestine**



**Final Exam**  
**2<sup>nd</sup> semester 2012/2013**  
**Total Grade: 50**

**Instructor Name:** Eng. Eman Alajrami  
**Student No.:** \_\_\_\_\_  
**Student Name:** \_\_\_\_\_  
**Dep. / Specialist:** \_\_\_\_\_  
**Using Dictionary (No)**

**First Question**

**No. of Branches (1)**

**(15/50)**

**Q1 B1**

**Essay Questions:**

a) Is it possible in general to have two primary indices on the same relation for different search keys? Explain your answer.

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b) During its execution, a transaction passes through several states, until it finally commits or aborts. List all possible sequences of states through which a transaction may pass.

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c) What is bucket overflow in a hash file organization? What can be done to reduce the occurrence of bucket overflows?

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d) Explain the basic steps of Query Processing? You may justify your answer by drawing.

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e) List the ACID properties of transactions. Explain the usefulness of each.

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<b>Second Question</b>	<b>No. of Branches (2)</b>	<b>(10/50 )</b>
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**Q2 B1)** Construct a B<sup>+</sup>-tree for the following set of key values:  
 (2, 3, 5, 7, 11, 17, 19, 23, 29, 31)  
 Assume that the tree is initially empty and values are added in ascending order.  
 Construct B<sup>+</sup>-trees for the case where the number of pointers that will fit in one node is 5. ( n = 5)

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Using Dictionary (No)

Third Question

No. of Branches (2)

(10/50)

**Q3 B1)** Consider the following SQL query for a bank database:

```
select T.branch-name
from branch T, branch S
where T.assets > S.assets and S.branch-city = "Brooklyn"
```

Write an efficient relational-algebra expression that is equivalent to this query.  
Justify your choice.


**Q3 B2)** Let relations  $r_1(A,B,C)$  and  $r_2(C,D,E)$  have the following properties:  $r_1$  has 20,000 tuples,  $r_2$  has 45,000 tuples, 25 tuples of  $r_1$  fit on one block, and 30 tuples of  $r_2$  fit on one block. And Let the Memory size in Blocks be 2000 Blocks.

Estimate the number of block accesses required, using each of the following join strategies for  $r_1 \bowtie r_2$ :

- a. Nested-loop join
- b. Block nested-loop join

Hint: Use the following formulas as appropriate for each of the above strategies:

$n_r * b_s + b_r$                       and                       $\lceil b_r / (M-2) \rceil * b_s + b_r$

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<b>Fourth Question</b>	<b>No. of Branches (2)</b>	<b>(7/50)</b>
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**Q4 B1)** Suppose that we are using hashing on a file that contains records with the following search-key values:

- 2, 3, 5, 7, 11, 17, 19, 23, 29, 31

Show the hash structure for this file if the hash function is

$h(x) = x \bmod 8$  and buckets can hold three records.

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**Q4 B2)** Show how the hash structure resulted from the previous question changes as the result of each of the following steps:

- a. Delete 11.    b. Delete 31.    c. Insert 1.    d. Insert 15.

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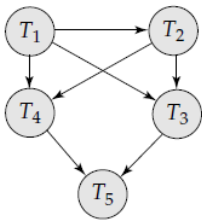
**Instructor Name:** Eng. Eman Alajrami  
**Student No.:** \_\_\_\_\_  
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**Using Dictionary (No)**

**Fifth Question**

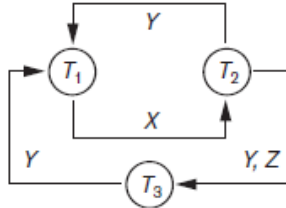
**No. of Branches (2)**

**(8/50 )**

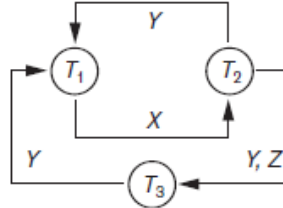
Consider the following precedence graph. Which of them is **conflict serializable**? If yes give an *equivalent serial schedule*. If no explain why?



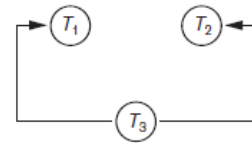
**(a)**



**(b)**



**(c)**



**(d)**

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**End of Questions**  
**Good Luck**