



**UNIVERSITY OF COLOMBO, SRI LANKA**

**UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING**



**DEGREE OF BACHELOR OF INFORMATION TECHNOLOGY (EXTERNAL)**

**Academic Year 2014/2015 – 3<sup>rd</sup> Year Examination – Semester 6**

***IT6404 - Database Systems II***  
***Structured Question Paper***

**19<sup>th</sup> July, 2015**  
**(TWO HOURS)**

**To be completed by the candidate**

BIT Examination Index No: .....

**Important Instructions:**

- The duration of the paper is **2 (two) hours**.
- The medium of instruction and questions is English.
- This paper has **4 questions** and **16 pages**.
- **Answer all questions** (25 marks each).
- **Write your answers** in English using the space provided **in this question paper**.
- Do not tear off any part of this answer book.
- Under no circumstances may this book, used or unused, be removed from the Examination Hall by a candidate.
- Note that questions appear on both sides of the paper.  
If a page is not printed, please inform the supervisor immediately.

**Questions Answered**

Indicate by a cross (×), (e.g. ☒) the numbers of the questions answered.

	Question numbers			
	1	2	3	4
<b><u>To be completed by the candidate by marking a cross (×).</u></b>				
To be completed by the examiners:				

1) (a) Why do databases use indexing techniques?

(02 marks)

**ANSWER IN THIS BOX**


(b) Briefly describe the following three indexing types.

(i) Primary Index

(ii) Secondary Index

(iii) Clustering Index

(06 marks)

**ANSWER IN THIS BOX**


- (c) Ordered indexing is of two types, namely Dense index and Sparse index. Explain Dense and Sparse indices identifying the differences between the two types.

(04 marks)

**ANSWER IN THIS BOX**

- (d) Multi-level Index helps in breaking down the index into several smaller indices in order to make the outermost level so small that it can be saved in a single disk block, which can easily be accommodated anywhere in the main memory. Briefly explain the B+ Tree and its structure. Give a simple example of a B+ Tree structure to illustrate how the leaf nodes and internal nodes are connected.

(05 marks)

**ANSWER IN THIS BOX***Continued...*

- ```
supplier(sno, sname, city, status);
shipment(sno, pno, quantity, shipment_date);
part(pno, pname, description);
```

(i) Assume that no indices are used for non-key fields. What is the most expensive way of processing the above query? Identify amount of records processed at the join and final result.

**ANSWER IN THIS BOX**

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- (ii) Suggest indexing techniques to make the above query efficient and explain how the query would be processed with the suggested indices.

(04 marks)

**ANSWER IN THIS BOX**

- 2) (a) (i) Consider the following schedule.

$w_1(a); r_2(a); w_1(b); w_3(c); r_2(c); r_4(b); w_2(d); w_4(e); r_5(d); w_5(e).$

Draw the precedence graph for the above schedule. Indicate if the graph has cycles or not. If the above schedule is a serializable schedule determine all the equivalent serial schedules and if not serializable, indicate why it is non-serializable and identify the type of conflict. Note that  $r_i$  and  $w_i$  denote respectively the read and write operations of transaction  $T_i$  for data item  $a, b, c, d$  &  $e$ .

(07 marks)

**ANSWER IN THIS BOX***Continued...*



(ii) Assume that each transaction will commit at the earliest possible point of time soon after completing its last transaction in the schedule given in (i) above. If the schedule was executed under two phase locking protocol, write down the locks acquired, released or changed (i.e. 'Release S(a)' to indicate release of shared lock for a) including any waiting for locks, commits or deadlocks at each of the times starting at  $t_1$ .

**ANSWER IN THIS BOX**

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- (ii) What are the values of the data items A, B, C, D and E on disk after recovery if the system crashes just before line 11 is written to disk?

(03 marks)

**ANSWER IN THIS BOX**

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- (iii) What are the values of the data items A, B, C, D, E, and F on disk after recovery if the system crashes just before line 18 is written to disk?

(02 marks)

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- 3) (a) Distribution transparency allows a physically dispersed database to be managed as though it were a centralized database. The level of transparency supported by the distributed DBMS varies from system to system. Three levels of distribution transparency are recognized, namely: Fragmentation transparency, Location transparency and Local mapping transparency. Briefly explain these three levels of distribution transparencies.

(06 marks)

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- Employee (Name, DOB, Address, Department, Location, Salary)

(i) Now suppose the end user wants to list all employees with Salary greater than 50,000. Write the SQL statement to retrieve the above information under Fragmentation transparency.

**ANSWER IN THIS BOX**

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- (ii) Now suppose the end user wants to list all employees with Salary greater than 50,000. Write the SQL statement to retrieve the above information under Location transparency.

(02 marks)

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- (iii) Now suppose the end user wants to list all employees with Salary greater than 50,000. Write the SQL statement to retrieve the above information under Local Mapping transparency.

(02 marks)

**ANSWER IN THIS BOX**

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- (c) The design of a distributed database introduces three new issues which are **not** present in a centralised database. Identify the three new issues and briefly explain each of them giving adequate details to identify how they are handled by a distributed database systems.

(09 marks)

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- (02 marks)**

**ANSWER IN THIS BOX**

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(ii) Suggest possible attributes for Dimension Table proposed in (i) above.

(03 marks)

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(iii) Draw a star schema for the above student data model.

(05 marks)

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(iv) For the above Student model propose an attribute hierarchy for Location of students and state how it can be used to retrieve data.

(02 marks)

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**ANSWER IN THIS BOX**

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