[This question paper contains 3 printed pages]

6260-A *Your Roll No*

M.Sc. COMPUTER SCIENCE/II Sem. J

MCS 203 -- DATABASE SYSTEMS AND IMPLEMENTATION

(OC)

Time 2 hours *Maximum Marks 40*

(Write your Roll No. on the top immediately on receipt of this question paper)

Attempt **all** *questions*
Use of calculator is allowed
Parts of a question should be answered together

1 (a) What are the advantages of RAID level 5 over RAID level 4? Explain with the help of an example (3)

(b) Consider a disk with block size 512 bytes A block pointer is 6 bytes long, and a record pointer is 7 bytes long A file has 30,000 EMPLOYEE fixed length records of 115 bytes each SSN is one of the fields in a record and occupies 9 bytes Suppose the file is ordered by the key field SSN and we want to construct a primary index on SSN Calculate

P T O

(i) the index blocking factor bfr_i (1)

(ii) the number of first-level index entries and the number of first-level index blocks. Assume that there is one index record for every block in the data file (2)

(iii) the number of levels needed if we make it into a multi-level index (2)

(c) Consider a disk with the following characteristics : block size B = 512 bytes, interblock gap size = 128 bytes. number of blocks per track = 20, number of tracks per surface = 400. A disk pack consists of 15 double-sided disks What is the total capacity of a cylinder and what is its useful capacity (excluding interblock gaps) ? (2)

2 (a) What is a collision in hashing ? Explain any two methods of collision resolution. (3)

(b) Differentiate between the following

(i) clustering and non-clustering indexes.

(ii) nested and block nested loop join (5)

(c) What is an equivalence rule ? Where is it used ? (2)

3 (a) Consider the following relational schema

Employee (personName, street, city)

Works(personName, companyName, salary)

Company(companyName, location)

Given the following relational algebra expression .

$\Pi_{\text{Employee personName, Works companyName location}} (\sigma_{\text{location = city A salary > 100000}} (\text{Employee} \bowtie \text{Works} \bowtie \text{Company})$

Construct a relational algebra tree and a relational algebra expression that reflects the order of operations a query optimizer would choose for the given expression (5)

(b) What is a transaction ? With the help of a diagram, explain the various states a transaction goes through (5)

4 (a) What do you understand by serializability ? Briefly explain various types of serializability (5)

(b) What are locking protocols ? How is strict two-phase locking protocol different from rigorous two-phase locking protocol ? (5)