

RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College under University of Calcutta)

B.A./B.SC. FIFTH SEMESTER EXAMINATION, DECEMBER 2013

THIRD YEAR

COMPUTER SCIENCE (Honours)

Date : 16/12/2013

Time : 11 am – 3 pm

Paper : V

Full Marks : 100

[Use a separate Answer Book for each group]

Group – A

(Answer any four)

1. a) In a university, there are four entities— student, faculty, course and department. A faculty member takes classes as well as guides students who are undergoing research in the university. A student can enroll in a department for a particular course only. The courses are conducted by the respective faculty members. A research project should be guided by at least one faculty member, but a faculty member can guide more than one project. A researcher can be associated with one project at a time. Draw the Entity-relationship diagram for the above scenario. [7]
b) What is a weak entity? How is it represented in an ERD? [2+1]
2. a) Describe the ANSI/SPARC architecture for a database system. How is data independence achieved from this? [5+3]
b) Define candidate key of a relational schema. [2]
3. a) Express the DIVISION operation in terms of basic relational algebra operations. [4]
b) What do you mean by the THETA JOIN operation in a relational model of database? [3]
c) State the difference between tuple relational calculus and domain relational calculus. [3]
4. a) Define 3NF. Also justify that BCNF is stricter than this. [2+3]
b) Consider a relation $R = \{A, B, C, D, E, F, G, H\}$ with the set of functional dependencies $FD = \{\{A, B\} \rightarrow \{C\}, \{A\} \rightarrow \{D, E\}, \{B\} \rightarrow \{F\}, \{F\} \rightarrow \{G, H\}\}$. Normalize this relation into 2NF. [5]
5. Consider the following relational schema :
EMP (eid, ename, address, Sal, Supervisional, deptid)
DEPT (deptid, dname, mgrid)
DEPT_LOC (deptid, deptloc)
PROJECT (Pno, pname, ploc, deptid)
WORK_ON (eid, Pno)
a) Write down the relational algebra and relational calculus expressions for the following query : [3+3]
For every project in Kolkata, find the project name, controlling department number and department manager's name.
b) Write down the SQL statement for the following query : [4]
For each employee, list the employee name along with their supervisor's name.
6. a) Suppose that a file is ordered by its key field SSN which has length of 4 bytes. A primary index on SSN is to be constructed. Assume that the block size (B) is of 572 bytes, the block pointer (P) is of 6 bytes and the record pointer (R) is of 7 bytes. The file contains 30,000 records and each record size (s) is of 50 bytes.
i) Calculate the number of levels needed if a multilevel index is made. [6]
ii) What will be the number of records in the highest level? [1]
b) Give an example of a query where ordered indexing is preferred to hashing. Give another example where hashing is preferred to ordered indexing. [3]
7. a) State Armstrong axioms. Why are they said to be sound and complete? [3+2]
b) Write down the algorithm to find out the closure of an attribute. [5]

Group – B

8. Answer **any two** : [2½×2]
- a) How can code reusability be achieved in an OOP language?
 - b) State the role of private access specifier in C++.
 - c) What is a pure virtual function in C++?

Answer **any two** :

9. a) Write a short note on data hiding in an object-oriented design paradigm. [4]
b) What is the importance of namespace in C++? [4]
c) What is a static data member of a class in C++? [2]
10. a) How is dynamic memory allocation done in C++? Illustrate. [4]
b) Describe the importance of inline function in C++. [3]
c) Is it possible to overload a destructor in C++? Justify. [3]
11. a) What is a friend Class? Explain with a C++ program. [5]
b) Is it possible to add flexibility to overload an operator if a friend function is used? Justify. [3]
c) What is a virtual base class? [2]
12. a) What is an exception in a C++ program? Is it possible to handle multiple exceptions using a single catch block in C++? [2+2]
b) What do you mean by overloading a function template? Illustrate. [6]

Group – C

13. Answer **any one** :
- a) What is software crisis? What are factors behind this? [2+3]
 - b) What are the differences between a program and a software product? What are the different types of system testing? [3+2]

Answer **any three** :

14. a) Explain the technique that the software engineering method uses to tackle the problem of exponential growth of problem complexity with its size. [4]
b) What are the advantages of a structured programming? [2]
c) State two basic differences between control flow-oriented and data flow-oriented design techniques. [2]
d) What are the differences between a methodology and a process? [2]
15. a) Describe the iterative waterfall model. What are its disadvantages? [5+2]
b) Why is the spiral model said to be a metal model? [3]
16. a) What are the differences between a logical DFD and a physical DFD? [4]
b) Define data dictionary? [2]
c) How does an SRS help a software maintenance engineer? [4]
17. a) What are the different categories of software according to the COCOMO? Define each of them. [3]
b) What are the different levels of testing before a software product is ready to be used? Explain **any one** of them. [3+3]
c) What do you mean by a software test case? [1]
18. a) How is transform analysis used in the analysis and design phase of software? [4]
b) What is the need for developing class diagram in UML? [2]
c) Draw the case-case diagram of a college library system. [4]

