II Semester M.C.A. Examination, Feb./March 2010
DISCRETE MATHEMATICS

Time: 3 Hours Max. Marks: 100

Instructions *: 1) Answer **all** questions in Part **A**, **5** out of **8** questions in Part **B** and **4** out of **6** questions in Part **C**.*
*2) Part **A** : Questions from **1** to **8** carry **1** mark and **9** to **14** carry **2** marks **each**.*
*3) Part **B** : **Each** question carries **8** marks.*
*4) Part **C** : **Each** question carries **10** marks.*

PART – A

1. Define a power set. Give an example.

2. Let U = {1, 2, 3, 4, 5, 6, 7, 8, 9}, A= {1, 2, 3, 7}, B= {4, 5, 6, 7} Compute $A \cap \overline{B}$.

3. Define contradiction.

4. If (2y+1, 2x-1) = (x-2, y-2) find the valued of x and y.

5. Define universal quantifier.

6. Let A= {1, 3, 5}, B= {2, 3}, write down B×A.

7. Define on-to function. Give an example.

8. Let f: $R \rightarrow R$ defined by

$$f(x) = \begin{cases} 3x-4 & \text{for } x>0 \\ -2x+3 & \text{for } x \le 0 \end{cases}$$

Determine f(0), f(-1).

9. Prove that for any two sets A and B, $\overline{A \cup B} = \overline{A} \cap \overline{B}$.

P.T.O.

10. Determine the sets A and B, given that $A - B = \{1, 2, 4\}$, $B - A = \{7, 8\}$ and $A \cup B = \{1, 2, 4, 5, 7, 8, 9\}$.

11. Construct the truth table for the compound proposition : $(p \rightarrow q) \wedge (q \rightarrow r)$.

12. Let $A = \{1, 2, 3\}$ and $B = \{2, 4, 5\}$. Determine the number of relations from A to B.

13. Let $R = \{(1, 2)\ (3, 4)\ (2, 2)\}$ and $A = \{(4, 2)\ (2, 5)\ (3, 1)\ (1, 3)\}$ be relations on the set $A = \{1, 2, 3, 4, 5\}$. Find $S^\circ(S^\circ R)$.

14. Let $X \rightarrow Y$ be a function and A and B be arbitrary nonempty subsets of X. Then prove that $f(A \cup B) = f(A) \cup f(B)$.

PART – B

1. Prove that, for any propositions p, q, r, the compound proposition $\{p \rightarrow (q \rightarrow r)\} \rightarrow \{(p \rightarrow q) \rightarrow (p \rightarrow r)\}$ is a tautology.

2. Define the negation of a conditional. Verify this using truth tables.

3. Prove by mathematical induction that, for all positive integers $n \geq 1$,

   $1+2+3+ - - - - - - - - - - - + n = 1/2\ n\ (n+1)$.

4. If R and S are equivalence relations on a set A, then prove that $R \cap S$ is an equivalence relation. Is $R \cup S$ an equivalence relation?

5. Define partition of a set. If A is a nonempty set, then prove that

   i) Any equivalence relation R on A induces partition of A.

   ii) Any partition of A gives rise to an equivalence relation R on A.

6. Prove that, there exists a one-to-one correspondence between the elements of a subgroup and the elements of the left (right) coset thereof.

7. For a group G, prove that the function $f: G \rightarrow$ defined by $f(a) = a\text{-}1$is an isomorphism if and only if G is abelian.

8. Define Euler graph. Prove that, a given connected graph G is an Euler graph if all vertices of G are of even degree.

PART – C

1. Using the laws of set theory, simplify the following:
   i) $(A - B) \cup (A \cap B)$
   ii) $\overline{(A \cup B) \cap C} \cup \overline{B}$

2. Consider the following open statements with the set of all real numbers as the universe.

   $p(x)$: $x \geq 0$ $\quad$ $q(x)$: $x^2 \geq 0$

   $r(x)$: $x^2 - 3x - 4 = 0$ $\quad$ $s(x)$: $x^2 - 3 > 0$

   Determine the truthness or falsity of the following statements.
   i) $\exists x, p(x) \wedge q(x)$
   ii) $\forall x, p(x) \rightarrow q(x)$
   iii) $\forall x, q(x) \rightarrow s(x)$
   iv) $\forall x, r(x) \vee s(x)$

3. Negate and simplify each of the following:
   i) $\exists x, \{p(x) \vee q(x)\}$
   ii) $\forall x, \{p(x) \wedge \neg q(x)\}$
   iii) $\forall x, \{p(x) \rightarrow q(x)\}$

4. Let A={1, 2, 3, 4, 6} and R be a relation on A defined by aRb if and only if a is a multiple of b. Represent the relation R as a matrix and draw its digraph.

5. Let A={1, 2, 3, 4, 5}, Define a relation R on A×A by (x1, y1) R (x2, y2) if and only if x1+ y1 = x2 + y2.
   i) Verify that R is an equivalence relation on A×A
   ii) Determine the equivalence classes [(1, 3)], [(2, 4)] and [(1, 1,)].

6. Prove that the intersection of two subgroups of a group is a subgroup of the group. Is the union of two subgroups of a group is a subgroup of the group? Justify your answer.

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II Semester M.C.A. Examination, Feb./March 2010
DBMS

Time: 3 Hours Max. Marks: 100

Instructions *: 1) Answer **all** questions in Part **A**, **5** out of **8** questions in Part **B**, and **4** out of **6** questions in Part **C**.*
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PART – A

1. What is a weak entity set ?
2. What are the two indexing techniques ?
3. What is the role of partial key.
4. What do you mean by entity integrity ?
5. What is a deadlock state ?
6. What is RDBMS ?
7. Define relational schema.
8. A relation is analogous to a ————————.
9. What is a virtual table ?
10. What is aggregation ?
11. Mention any 2 features of a hierarchical data model.
12. What is a 1:M relationship ?
13. Write any two file organization techniques.
14. What are the different transaction states ?

P.T.O.

PART – B

1. Explain the three level architecture of DBMS.
2. Distinguish between physical and logical data independence.
3. Explain fixed length and variable length records.
4. Mention the properties of a Relation Tables.
5. Explain Third Normal Form with an example.
6. Explain an Update Cascade and Check Clause.
7. Write a note on Crash recovery.
8. Write a short note on Characteristics of Distributed database.

PART – C

1. Explain the relational data model with its advantages and disadvantages.
2. Discuss implementation of direct file organization.
3. "Virtually every database is implemented internally as some variant of B-Trees" Comment on this statement.
4. Explain the concept of lossless decomposition with respect to 5NF.
5. Determine the path that must be chosen in converting from an old existing system to a new system.
6. Explain concurrency control and strict two-phase locking.

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II Semester M.C.A. Examination, Feb./March 2010
OOPS WITH C++

Time: 3 Hours Max. Marks: 100

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PART – A

1. Define inline function.
2. What is the size of the empty class?
3. Give two applications of OOP.
4. What are function templates ?
5. Define virtual function.
6. Define User defined data type.
7. Define friend function.
8. Define encapsulation.
9. Explain the differences between private and protected members ?
10. Explain static data member with example.
11. Explain virtual base classes.
12. Define operator overloading.
13. Define structure. Explain with an example.
14. Explain Dynamic cast operator.

P.T.O.

PART – B

1. Define Data type. Explain different types of data type with examples.
2. Explain different string functions with an example.
3. Explain different control structures with an example.
4. Define Arrays. Explain different types of arrays with an example.
5. Write a C++ program to explain the concept of friend function.
6. Write a C++ program to add two complex numbers.
7. Define function. Explain different parameter passing mechanisms.
8. Write a note on :
   a) Constructor and Destructor in derived class.
   b) Friend function in operator overloading.

PART – C

1. Define Constructors. Explain different types of constructor with a program.
2. Write a C++ program to overload a Unary operators ++ and - -.
3. Define Inheritance. Explain different types of inheritance with an example.
4. Explain basic concepts of object-oriented programming.
5. Write a Template program to sort the array of integers and double by using Bubble- sort technique.
6. Write a note on :
   a) Scope Resolution Operator.
   b) Cin and Cout statements with example.
   c) Pointers in C++.

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II Semester M.C.A. Examination, Feb./March 2010
COMPUTER ORGANIZATION AND ARCHITECTURE

Time : 3 hours Max. Marks : 100

Instructions *: 1) Answer **all** questions in Part **A**, **5** out of **8** questions in Part **B**, and **4** out of **6** questions in Part **C**.*
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PART – A

1. What is a digital computer?
2. What is a program?
3. What is a Main Frame Computers?
4. What is a Buffer?
5. What are Multiplexer?
6. What is a cache memory?
7. What is a ROM?
8. Define Boolean algebra.
9. What is DMA?
10. What are hardware interrupts? Give an example.
11. Explain time-shared common bus.
12. What are different I/Os? Explain.
13. Explain the Von Neumann Architecture.
14. What is a virtual memory?

P.T.O.

PART – B

1. Explain different functional units of a digital computer with a neat block diagram.
2. What are the advantages and disadvantages of RISC?
3. Explain in brief different types of interrupts.
4. Present Least-recently-used (LRU) method with 3 frames.
5. Discuss register stack and memory stack.
6. What is the need of master-slave flip-flop? With the help of a logic diagram, explain the working of the master-slave flip-flop.
7. Discuss how floating point numbers are represented in a computer. Take suitable examples.
8. Explain the Von Neumann architecture, with the help of a suitable diagram. Discuss the advantages and disadvantages of this architecture.

PART – C

1. Write and explain flowchart for I pass assembler.
2. With a neat diagram explain three state table buffers.
3. Give the block diagram of crossbar switch and explain in brief.
4. Explain how DMA transfer will improve the data transfer rate in a computer.
5. Draw and explain the architecture of microcomputer.
6. What is pipelining? Explain pipelining through space – time diagram for 5 instructions with 6 stages each.

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