M   (Printed Pages 4)

(21214)   Roll No. ....

MCA. III Sem.

MCA-62

MCA Examination, Dec. 2014

Design & Analysis of Algorithms

MCA-312(N)

Time : Three Hours]   *[Maximum Marks : 100*

Section-A

Note: All questions are **compulsory**.

1. Illustrate the operation of insertion sort on
    the array A=(31,41,59,26,41,58)   4

2. What is complexity of an algorithm. How do
    you assign complexity to an algorithm. Do it
    in the case of matrix multiplication algorithm.

    4

3. What is the largest possible number of inter-
    nal nodes in a red-black tree with black-height
    K? What is the smallest possible number?
    Describe your answer.   4

P.T.O.

4. Differentiate between P, NP and NP - complete problems illustrating with a suitable example for each one of them. 4

5. Describe a data structure that may be used for disjoint sets. 4

Section-B

Note: Attempt any **two** questions.

1. If $f(n)$ and $g(n)$ are monotonically increasing functions, show that the functions $f(n)+g(n)$ and $f(g(n))$ are also increasing monotonically. Show also that if $f(n)$ and $g(n)$ are in addition nonnegative then $f(n) . g(n)$ is monotonically increasing.

2. Augment the red-black tree suitably and write the algorithm to determine the rank of an element x in an order-statistic tree containing n distinct elements. 10

3. Differentiate between brute force, recursive, dynamic programming and memorization approaches to problem solving with the help of an illustrative example. 10

Section-C

Note: Attempt any **three** questions.

1. (a) Show that an n-element heap has height [log n]. Show that the worst-case running time of heapsort is $\Omega(n \log n)$.

   (b) What is the running time of quick-sort when all elements of array A have the same value? Validate your answer. 10+10

2. (a) Explain how the minimum key stored in a B-tree and the predecessor of a given key stored in a B-tree may be found. 10+10

   (b) Write the pseudocode for deleting a key from a B-tree 10+10

3. (a) Explain how the minimum key stored in a B-tree and the predecessor of a given key stored in a B-tree may be found.

   (b) Write the pseudocode for deleting a key from a B-tree 10+10

4. (a) Write the procedure for Depth First Search.

(b) Explain how a vertex u of a directed graph can end up in a depth-first tree containing only u, even though u has both incoming and outgoing edges in G. 10+10

5. (a) Write Prim's algorithm for solving the minimum spanning tree problem. illustrate with the help of an example. Show that the running time for this algorithm is $O(E \log V)$ which may be sped up to $O(E+V \log V)$ by using Fibonacci heaps.

(b) What are approximation algorithms? Illustrate with the help of a suitable example. 10+10

M

(21214)

MCA-III Sem.

MCA-42

MCA Examination, Dec. 2014

Software Engineering

[MCA-313]

Time : Three Hours]   *[Maximum Marks : 100*

Note : Attempt **all** Sections as per instructions.

Section-A

Attempt all the **five** questions. Each question carries 4 marks.   4×5=20

1. What are the characteristics and criteria for design?

2. What are different activities in user interface design process? Elaborate each of these activities.

P.T.O.

3. Differentiate between black-box and white-box testings.

4. Justify the statement "Software maintenance is costlier".

5. Explain clearly the concepts of coupling and cohesion.

Section-B

Attempt any **two** questions, out of **three**. Each question carries ten marks. $10 \times 2 = 20$

6. (a) Explain top-down approach used in Integration testing.

   (b) Explain the type of system testing.

7. State the advantages and disadvantages of the evolutionary model of software development.

8. Who will test the software, either developer or an independent test group? Discuss the advantages and drawbacks of each one.

Section-C

Attempt any **three** questions out of following five questions. Each question carries 20 marks. $20 \times 3 = 60$

9. (a) Define and explain abstraction and refinement. Also differentiate between them. 15

   (b) What is factorizing? Why is it done? 5

10. Write short-notes on the following :

   (i) System Software

   (ii) Structured constructs

   (iii) Functional decomposition

   (iv) CASE Tools

11. (a) Discuss about Security Testing and Performance Testing. 7

   (b) State and explain various debugging tactics. 6

P.T.O.

(c) What are the questions that every software engineer should ask before making the "Correction" that remove the cause of a bug? 7

12. (a) Explain the five software assessment principles. 5

(b) Discuss about various phases of assessment. 15

13. (a) Discuss seven principles of risk management which were identified by SEI.

(b) Distinguish between generic risks and product specific risks.

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MCA. III Sem.

MCA-63

MCA Examination, Dec. 2014
Data Base Management Systems
MCA-313(N)

Time : Three Hours]   *[Maximum Marks : 100*

Note: Attempt **all** the sections as per instructions:

Section-A

Note: Attempt **all** questions.

1. Define/Explain the following: 4

    DML, Data independence, Super key, Entity

2. Write down the role of tuple and domain calculus in relational data model.   4

3. What is transaction failure? Give an example of transaction failure.   4

P.T.O.

4. Discuss SQL data types and literals. 4

5. What is query processing? Give the steps involved in processing a query. 4

Section-B

Note: Attempt any **two** questions out of the following three questions.

6. Describe the three- level architecture of a database system. Why do we need mappings (views) between various levels? 10

7. Define 'entity' and 'association'. Discuss the E-R model. 10

8. (a) What is a view in SQL and how is it defined? Discuss the problems that may arise when one attempts to update a view. 4

   (b) Explain insert, delete, and update statements in SQL. 6

Section-C

Note: Attempt any **three** questions out of the following **five** questions.

9. (a) What do you understand by functional dependency? How does functional dependency act as a constraint in normalization? 10

   (b) What is a foreign key constraint? Why is such a constraint important in DBMS? 10

10. (a) Discuss deadlock handling in databases in detail. 10

    (b) Compare database system and file system. 10

11. Illustrate the use of any **five** of following operations of relational algebra: 20

    Selection, Projection, Intersection, Difference, Division, Theta Join

12. What should a DBMS guarantee with respect to concurrent execution of several transactions and database consistency? Discuss locking techniques for concurrency control. 20

13. (a) Discuss the components of a DBMS. What are the characteristics of a good DBMS? 10

    (b) Define a "schedule" and "serializability of schedule". Give algorithm for testing serializability of a schedule. 10

MCA-14(N)

M.C.A. Examination, Dec. 2014

Object Oriented Systems

[MCA-314(N)]

Time : Three Hours]   *[Maximum Marks : 100*

Note: Attempt question in all Sections as per in-
structions.

Section-A

Attempt all **five** questions. Each question

carries 4 marks. 4×5

1. What are the characteristics of Object Ori-
    ented Programming Language?   4

2. What do you understand by the class tem-
    plates?   4

3. What do you mean by the C++ Program-
   ming Language? What are the needs & ad-
   vantages of C++?   4

4. What do you mean by the constraints?   4

5. Define static keyword & Access specifiers?
                                             4

Section-B

Attempt any **two** questions. Each question
carries 10 marks.

6. What do you mean by the class & object?
   Write an example for class & object?   10

7. Define & Differentiate constructor & Destruc-
   tor with their syntax?   10

8. What do you mean by Model? Explain differ-
   ent types of Models and the Relationship
   among them?   10

Section-C

Attempt any **three** questions. Each ques-
tion carries 20 marks.   20 × 3

9. Give a Comparison between Aggregation
   and Generalization with a suitable example?
   Also explain the types of Aggregation with a
   suitable example?   10+10

10. What do you mean by the Access modifi-
    ers? How many types of Access modifiers
    used in C++? Also explain their meaning
    when a class inherit from a base class using
    Private & Public keyword? Give a suitable
    example?   20

11. Define & differentiate the following with ex-
    ample?   5 × 4

    (a) Event and States

    (b) OMT and SA/SD

    (c) Object diagram and Class diagram

    (d) JSD and OMT

12. What do you mean by Polymorphism? Discuss about the types of polymorphism? Write a program for the polymorphism? Also discuss the virtual methods used in C++, with the help of example? 10+5+5

13. (a) Define s/w Process and differentiate between procedure oriented & object oriented paradigm? 10

    (b) What do you mean by the Exception handling? Define it with the help of an example? 10