D 94112

Name.....

Reg. No.....

FIRST SEMESTER M.C.A. (REGULAR) DEGREE EXAMINATION, NOVEMBER 2020

M.C.A.

MCA 20 105—ADVANCED DATABASE MANAGEMENT SYSTEMS

(2020 Syllabus Year)

Time : Three Hours | Maximum : 100 Marks

Answer any **five** *full questions.*
Each question carries 20 *marks.*

1. (a) Compare and contrast the Relational Database Model and Network Model. (8 marks)

   (b) What is Normalization ? Explain first three normal forms with relative advantages and disadvantages. (12 marks)

2. (a) What are the common clauses used with SELECT query in SQL ? (10 marks)

   (b) Describe the difference between an equi-join and a non-equi join with example. (5 marks)

   (c) What is Postgres SQL ? Explain its advantages. (5 marks)

3. (a) Explain the concurrency control mechanisms in databases. (10 marks)

   (b) Write a note on transactions and schedule. (10 marks)

4. (a) Distinguish between Object oriented and Object relational databases. (8 marks)

   (b) Write notes on data warehousing, data mining and big data. (12 marks)

5. (a) Explain the Automated database management concepts and database security. (10 marks)

   (b) How do you expose a database as a Web service ? (10 marks)

6. (a) Explain the concept of fragmentation replication and allocation in distributed database systems. (12 marks)

   (b) Explain Spatial Databases and its applications. (8 marks)

7. Distinguish the following :

   (a) DDL and DML. (b) SQL and No-SQL.

   (c) ER and EER. (d) 4NF and BCNF.

   (4 × 5 = 20 marks)

[5 × 20 = 100 marks]

D 94111

Name.....

Reg. No.....

FIRST SEMESTER M.C.A. (REGULAR) DEGREE EXAMINATION, NOVEMBER 2020

M.C.A.

MCA 20 104—COMPUTATIONAL INTELLIGENCE

(2020 Syllabus Year)

Time : Three Hours | Maximum : 100 Marks

Answer any **five** *full questions.*
Each question carries 20 *marks.*

1. (a) Explain the scope of Artificial Intelligence in solving real-life problems. (5 marks)
   (b) What are inference rules ? Explain with examples. (10 marks)
   (c) How to define the problems as state space search ? (5 marks)
2. (a) What is generate and test strategy ? Explain. (6 marks)
   (b) Explain Steepest Ascent Hill Climbing strategy. (8 marks)
   (c) Describe the concepts of problem reduction in Heuristics search. (6 marks)
3. (a) With suitable examples, explain Best First search algorithm. (10 marks)
   (b) What do you mean by constraint satisfaction ? Explain with an algorithm. (10 marks)
4. (a) List out and explain the approaches to knowledge representation. (12 marks)
   (b) What are the common issues in knowledge representation. (8 marks)
5. (a) What is non-monotonic reasoning ? Explain the logic for non-monotonic reasoning. (10 marks)
   (b) Write a note on dependency directed backtracking in the context of depth first search. (10 marks)
6. (a) Explain Reinforcement Learning with two supporting examples. (10 marks)
   (b) Write a note on the features of the expert system—MYCINE. (10 marks)
7. (a) With suitable example, explain minimax procedure. (10 marks)
   (b) Explain the terms "Alpha-beta cut-offs' and "iterative deepening". (10 marks)

[5 × 20 = 100 marks]

D 94110 (Pages : 2) Name.....

Reg. No.....

FIRST SEMESTER M.C.A. DEGREE (REGULAR) EXAMINATION NOVEMBER 2020

M.C.A.

MCA 20 103—DISCRETE MATHEMATICAL STRUCTURES

(2020 Syllabus Year)

Time : Three Hours Maximum : 100 Marks

Answer any **five** *full questions.*
Each question carries 20 *marks.*

1. (a) Show that for any two finite sets A and B $|A \cup B| \leq |A| + |B|$.

   (b) Let f and g are two functions from R-->R defined as $f(x) = x^2 + 1$ and $g(y) = 2y + 3$ find $f \circ g$ and $g \circ f$ Here R is the set of real numbers.

   (10 + 10 = 20 marks)

2. (a) Define Equivalence relation. Show that the relation S defined by aSb if and only if a-b is an integer multiple of 5 is an equivalence relation on the set of integers Z.

   (b) Let $A = \{1,2,3,4,5\}$; $B = \{2,4,5,6,7\}$ and $C = \{4,6,8,9\}$.

   Verify that $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$.

   (10 + 10 = 20 marks)

3. (a) Check whether $\neg(P \wedge Q)\ (\neg P\ \neg Q)$ is a tautology or not by constructing its truth table.

   (b) Symbolize the following using quantifiers, predicates and logical connectives :

   (i) The square of any real number is greater than or equal to zero.

   (ii) Every integer is either odd or even.

   (iii) Not all real numbers are rational numbers.

   (iv) Some people are vegetarian.

   (10 + 10 = 20 marks)

4. (a) Illustrate the following with examples :

   (i) Group. (ii) Subgroup.

   (b) Show that the set of integers Z is a ring under ordinary addition and multiplication.

   (10 + 10 = 20 marks)

Turn over

5. (a) Define a partial order. Give an example of a partially ordered set that have a least element, but no greatest element.

   (b) Let S = {*a*, *b*, *c*}. *Draw* the Haase diagram of the power set of S.

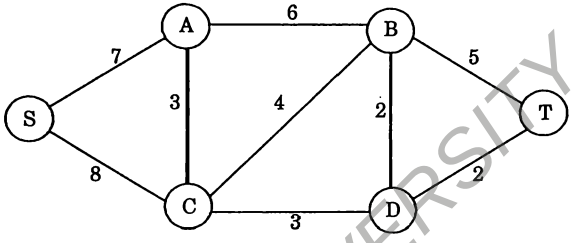
(10 + 10 = 20 marks)

6. (a) Give an example of two non isomorphic graphs each with 5 vertices and 4 edges. Justify your answer.

   (b) Explain Dijkstra's algorithm with an example.

(10 + 10 = 20 marks)

7. (a) Find a minimal spanning tree of the graph given below by Kruskal's algorithm.



   (b) Explain the adjacency list representation of graphs with an example.

(10 + 10 = 20 marks)

[5 × 20 = 100 marks]

D 94109 **(Pages : 2)** **Name**.....

Reg. No.....

FIRST SEMESTER M.C.A. (REGULAR) DEGREE EXAMINATION, NOVEMBER 2020

M.C.A.

MCA 20 102—PROGRAMMING IN JAVA

(2020 Syllabus Year)

Time : Three Hours Maximum : 100 Marks

Answer any **five** *full questions.*
Each question carries 20 *marks.*

1. (a) Explain the features of object oriented programming comparing with procedure oriented programming.

(8 marks)

(b) Explain the structure of Java programme with various data types available in Java.

(12 marks)

2. (a) Write a Java program to calculate the area of different shapes namely circle, rectangle, and triangle using the concept of method overloading.

(10 marks)

(b) Explain parameter passing in Java, with suitable examples. (5 marks)

(c) Describe the use of constructor in Java, with suitable examples. (5 marks)

3. (a) What is exception ? List any four exception classes in Java. Explain various exception handling keywords in Java, with examples.

(10 marks)

(b) Explain life cycle of thread in detail. (10 marks)

4. (a) Explain event handling in Java. (5 marks)

(b) Compare swing and AWT in Java. (5 marks)

(c) Write an applet which displays the character when a key is typed using event handling mechanism.

(10 marks)

5. (a) Explain the steps in connecting Java program to database, with example. (10 marks)

(b) Explain the methods used for TCP/IP client and server sockets connections.

(10 marks)

6. (a) Write an applet which displays the x-y co-ordinates of mouse, when it is clicked. Use event handling mechanism.

(6 marks)

Turn over

(b) Explain the use of graphics class in Java. (4 marks)

(c) What are the advantages of using Swing API ? List any five containers and components available in Swing API.

(10 marks)

7. (a) Illustrate the usage of different types of JDBC drivers available in Java with example programme statements.

(10 marks)

(b) Explain the JDBC architecture with a diagrammatic representation. (10 marks)

[5 × 20 = 100 marks]

D 94108 (Pages : 2) Name.....

Reg. No.....

FIRST SEMESTER M.C.A. (REGULAR) DEGREE EXAMINATION, NOVEMBER 2020

M.C.A.

MCA 20 101—DESIGN AND ANALYSIS OF ALGORITHMS

(2020 Syllabus Year)

Time : Three Hours Maximum : 100 Marks

Answer any **five** *full questions.*
Each question carries 20 *marks.*

1. (a) Explain the importance of algorithms in computing. Give any two methods of specifying an algorithm.

   (b) Give a brief note on any two graph problems and their applications.

   (10 + 10 = 20 marks)

2. (a) Explain Strassen's matrix multiplication problem. Compare the time complexity of this method with that of the conventional method for matrix multiplication.

   (b) What is the use of asymptotic notations ? Discuss the various asymptotic notations used in the analysis of algorithms.

   (10 + 10 = 20 marks)

3. (a) Formulate the recurrence relation for the recursive merge sort algorithm.

   (b) Explain the general characteristics of problems for which the Backtracking algorithm design strategy provides efficient algorithms. Give an example.

   (10 + 10 = 20 marks)

4. (a) With the help of a schematic representation, explain the relationship among P, NP, NP-complete, and NP-hard problems.

   (b) Give an application of the Hamiltonian cycle problem. Why the Hamiltonian cycle problem is NP-complete ?

   (10 + 10 = 20 marks)

5. (a) What are the variants of PRAM models ? How is the concurrent write problem is handled in the PRAM models ?

   (b) What is meant by a parallel algorithm ? How can we analyse parallel algorithms ?

   (10 + 10 = 20 marks)

Turn over

6. (a) With the help of a suitable example, explain the Dynamic Programming algorithm design strategy.

   (b) Compare and contrast Prim's and Kruskal's approaches to find the shortest spanning trees.

(10 + 10 = 20 marks)

7. (a) Explain different techniques to solve the recurrence relations.

   (b) Solve the following recurrence relations using the Master Theorem :

   (i) $T(n) = 16\,T(n/4) + n$.

   (ii) $T(n) = 2T(n/2) + \theta(n)$.

(10 + 10 = 20 marks)

[5 × 20 = 100 marks]

C 83625

Name.....

Reg. No.....

FIRST SEMESTER M.C.A. (LATERAL ENTRY) REGULAR DEGREE EXAMINATION, APRIL 2020

M.C.A.

MCA L 18 105—COMPUTER ARCHITECTURE

Time : Three Hours Maximum : 100 Marks

Answer any **five** *full questions.*
Each question carries 20 *marks.*

1. A) Explain the Flynn's classification of computer architecture. (10 marks)

   B) Discuss about various parallel programming models. (10 marks)

2. A) With reference to pipelining, what is data hazard ? Explain briefly about possible data hazards. (10 marks)

   B) Describe in brief the architecture of a vector processor ? Explain how can it be implemented? (10 marks)

3. A) Give an account on parallel algorithms for array processors (10 marks)

   B) What is the difference between a single-stage and multistage interconnection network ? Give one example of each. Also explain the relative advantages of these two categories of interconnection networks. (10 marks)

4. A) What is multiprocessor cache coherence ? Explain the basic synchronization mechanism for multi processors. (10 marks)

   B) Give a detailed account on parallel memory organization. (10 marks)

5. A) Write a note on VLSI computing structures. (10 marks)

   B) Give an account on dataflow computer architecture. (10 marks)

6. A) Define vector processors. Explain vector processing in detail. (10 marks)

   B) Explain the mechanism for instruction pipelining. (10 marks)

7. A) What are the different stages in pipeline ? Explain in detail. (10 marks)

   B) Describe the roles played by various registers in a SIMD processor. (10 marks)

[5 × 20 = 100 marks]

C 83624

Name.....

Reg. No.....

FIRST SEMESTER M.C.A. (LATERAL ENTRY) REGULAR DEGREE EXAMINATION, APRIL 2020

M.C.A.

MCA L 18 104—ADVANCED DBMS

Time : Three Hours Maximum : 100 Marks

Answer any **five** *full questions.*
Each question carries 20 *marks.*

1. A) Compare and contrast BCNF and 3NF with examples. (10 marks)

   B) What is E-R diagram ? Explain any four attributes in E-R model with suitable example. (10 marks)

2. A) Explain the delete and update statements in SQL with examples. (10 marks)

   B) Give brief account on Postgres SQL and SQLite database systems. (10 marks)

3. A) What is serializability ? Explain its types with examples. (10 marks)

   B) Discuss why concurrency control and recovery is needed in transaction processing in Database Management Systems. (10 marks)

4. A) Explain the architecture of distributed database management systems. (10 marks)

   B) Compare and contrast Data Mining and Big Data Analysis. (10 marks)

5. A) Give an account on AWS with cloud environment. (10 marks)

   B) What is NoSQL ? Explain the features of NoSQL Databases. Also explain different types of NoSQL databases. (10 marks)

6. A) Discuss the concurrency control mechanism in detail using suitable example. (10 marks)

   B) Differentiate between table and virtual table. Also give the appropriate SQL statements for creating both table and virtual table using suitable examples. (10 marks)

7. A) Explain the ACID properties of transaction. (10 marks)

   B) Explain the function and syntax of any two DML and DCL statements. (10 marks)

[5 × 20 = 100 marks]

C 83623 (Pages : 3) Name.....

Reg. No.....

FIRST SEMESTER M.C.A. (LATERAL ENTRY) REGULAR DEGREE EXAMINATION, APRIL 2020

M.C.A.

MCA L 18 103—DISCRETE MATHEMATICAL STRUCTURES

Time : Three Hours Maximum : 100 Marks

Answer any **five** *full questions.*
Each question carries 20 *marks.*

1. A (i) Show that for any *two* sets $A - (A \cap B) = A - B$. (4 marks)

(ii) Let $A = \{x \mid x \text{ is an integer and } 1 \le x \le 5\}$, $B = \{3, 4, 5, 17\}$ and $C = \{1, 2, 3, ...\}$,

find $A \cap B$, $A \cap C$, $A \cup B$, $A \cup B$. (6 marks)

B A survey among 100 students shows that out of the three ice cream flavors vanilla, chocolate, strawberry, 50 students like vanilla, 43 like chocolate, 28 like strawberry, 13 like vanilla and chocolate, 11 like chocolate and strawberry, 12 like strawberry and vanilla and 5 like all of them. Find the following :

(i) Chocolate but not strawberry.

(ii) Chocolate and strawberry but not vanilla.

(iii) Vanilla or Chocolate but not strawberry. (10 marks)

2. A (i) Prove that $(\neg P \wedge \neg Q \wedge R) \vee (Q \wedge R) \vee (P \wedge R) \Leftrightarrow R$. (5 marks)

(ii) Construct truth table for $P \leftrightarrow ((P \rightarrow Q) \wedge \neg(\neg Q \vee \neg P))$. (5 marks)

B What is principle conjunctive normal form ? Obtain the PCNF of $(\neg P \rightarrow R) \wedge (Q \leftrightarrow P)$.

(10 marks)

3. A (i) Show that every interval of a lattice is a sublattice. (5 marks)

(ii) Draw Hasse diagram for $(\{3, 4, 12, 24, 48, 72\}, /)$. (5 marks)

Turn over

B In the Boolean algebra B, prove that for elements $a, b, c \in B$:

(i) $(a + b)(a' + c)(b + c) = ac + a'b + bc$.

(ii) $(a + b)' + (a + b')' = a'$

(iii) $ab + a'b' = (a + b')(a' + b)$.

(iv) $a + bc = (a + b)(a + c)$. (10 marks)

4. A (i) Prove that $\{1, i, -i, -1\}$ is a cyclic group. (5 marks)

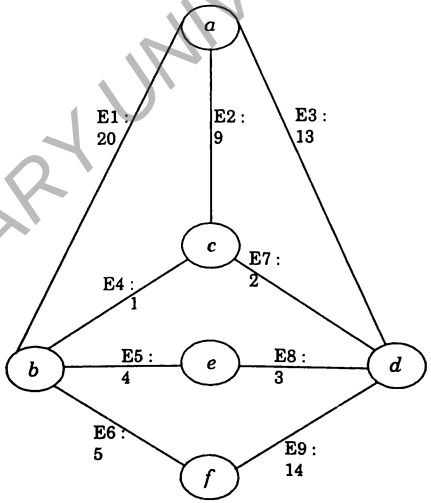
(ii) Prove that the set of odd and even positive integers closed under multiplication is a sub semigroup of $(M, \times)$. (5 marks)

B Let G be the group of all non-zero complex numbers $a + bi$ (a, b real, but not both zero) under multiplication, and let $H = \{a + bi \in G \mid a\,2 + b\,2 = 1\}$ Verify that H is a subgroup of G.

(10 marks)

5. A Explain Bellman-Ford algorithm with suitable example. (10 marks)

B Find the minimum spanning tree of the following graph using Prim's algorithm.



(10 marks)

6. A Explain Ring with example. (10 marks)

B Functions f and g are given by $f(x) = \sqrt{(x+2)}$ and $g(x) = \ln\left(1 - x^2\right)$. Find the composite function defined by $(g \circ f)(x)$ and describe its domain. (10 marks)

7. A (i) Explain partially ordered set and totally ordered set with examples. (6 marks)

(ii) Explain different types of lattices. (4 marks)

B (i) Explain Conditional and Biconditional Statements. (5 marks)

(ii) Explain Variables and Quantifiers. (5 marks)

[5 × 20 = 100 marks]

C 83622

Name.....

Reg. No.....

FIRST SEMESTER M.C.A. (LATERAL ENTRY) REGULAR DEGREE EXAMINATION, APRIL 2020

M.C.A

MCA L 18 102—PROGRAMMING IN JAVA

Time : Three Hours Maximum : 100 Marks

Answer any **five** *full questions.*
Each question carries 20 *marks.*

1. A) What is inheritance ? Explain the different types of inheritance in Java. Also explain how multiple inheritance is achieved in Java. (10 marks)

   B) Explain the different visibility modifiers in a class. (5 marks)

   C) Explain the differences between polymorphism and encapsulation. (5 marks)

2. A) Write a Java program to add two complex numbers using operator overloading principle. (10 marks)

   B) Give an account on packages in Java ? Explain how will you create and access packages in Java with illustration. (10 marks)

3. A) Describe the life cycle of a thread in Java. (10 marks)

   B) What are the advantages of Exception Handling ? How can we catch Multiple Exceptions in Java ? (10 marks)

4. A) Write an applet program that receives three numeric values as input from the user and then display the largest of three on the screen. (10 marks)

   B) Give an account on filtered I/O streams in Java. (10 marks)

5. A) Explain the different types of statements in JDBC with example. (10 marks)

   B) What is InetAddress ? Explain the steps for creating a socket in Java for communicating between two JVMs. (10 marks)

6. A) What are the differences between Interface and abstract class ? Also explain the properties of Interface. (10 marks)

   B) Explain any two loop control structures in Java with examples. (10 marks)

7. A) What are constructors ? Explain the different types of constructors in Java with examples. (10 marks)

   B) Describe the AWT event hierarchy in detail. (10 marks)

[5 × 20 = 100 marks]

C 83621

Name.....

Reg. No.....

FIRST SEMESTER M.C.A. (LATERAL ENTRY) REGULAR DEGREE EXAMINATION, APRIL 2020

M.C.A.

MCA L 18 101—DESIGN AND ANALYSIS OF ALGORITHM

Time : Three Hours Maximum : 100 Marks

Answer any **five** *full questions.*
Each question carries 20 *marks.*

1. A) What are the important characteristics of an algorithm ? Explain. (10 marks)
   B) Distinguish RAM model and PRAM model. (10 marks)
2. A) What are the methods to solve recurrences ? Explain. (10 marks)
   B) Solve the recurrence $T(n) = 2T(\sqrt{n}) + \log n$. (10 marks)
3. A) Merge sort algorithm closely follows the divide and conquer paradigm. Explain the meaning of the statement. (10 marks)
   B) Compute the runtime complexity of Merge sort algorithm. (10 marks)
4. A) Differentiate P and NP problems. (10 marks)
   B) Write a note on Traveling Salesman Problem. (10 marks)
5. A) Explain the concept of parallel sorting with an example. (10 marks)
   B) Explain about the time complexity in the case of parallel algorithm. (10 marks)
6. A) Show that Strassen's matrix multiplication algorithm is faster than standard matrix multiplication algorithm. (10 marks)
   B) Compute the time complexity of the following :

```
for i <— 4 to m-1
{ for j <— 5 to i
{
Set Y <— Y + X[i][j]
}
}
```

(10 marks)

7. A) Solve the recurrence $T(n) = 3T(n/2) + n^2$. (10 marks)
   B) Given a set S = {2, 4, 6} and Weight = 6. Find subset sum using Backtracking approach. (10 marks)

[5 × 20 = 100 marks]

C 81532 (Pages : 2) Name.....

Reg. No.....

FIRST SEMESTER M.C.A. DEGREE EXAMINATION, APRIL 2020

M.C.A.

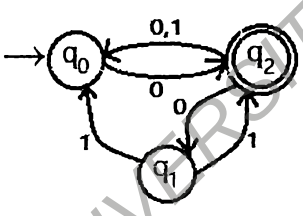
MCA 18 105—THEORY OF COMPUTATION

(2018 Admissions)

Time : Three Hours Maximum : 100 Marks

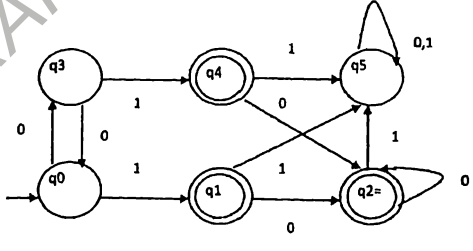
Answer **five** *full questions.*
Each question carries 20 *marks.*

1. (a) Convert the following NFA to DFA. Write down the steps for the conversion of NFA to DFA.



(10 marks)

(b) Write down the steps for DFA state minimization. Using those steps minimize the following DFA.



(10 marks)

Turn over

2. (a) Write a CFG for language L = $\{0^i 1^j 2^k \mid k <= i \text{ or } k <= j\}$.

(10 marks)

(b) Write down the steps for conversion of a Context Free Grammer to Chomsky Normal Form. Convert the following grammer into Chomsky Normal Form. (Show each steps.)

$S \rightarrow ASB$

$A \rightarrow aAS \mid a \mid \varepsilon$

$B \rightarrow SbS \mid A \mid bb.$

(10 marks)

3. Give pushdown automata that recognize the following languages

(a) $F = \{ a^{2n} b^{3n} \mid n \geq 0 \}$ (10 marks)

(b) $L = \{a^* w c^k \mid w \in \{a, b\}^* \text{ and } k = |w|_a, (k = \text{the number of as in } w)\}$

(10 marks)

4. (a) Write about Non-deterministic Turing machines. (10 marks)

(b) Explain in detail about Church thesis. (10 marks)

5. (a) Briefly explain about a Hamiltonian Path Problem and prove that it belongs to class of NP problems.

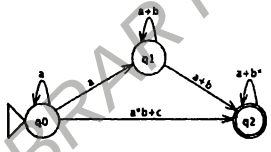
(10 marks)

(b) Explain in detail about satisfiability problem with examples. (10 marks)

6. (a) Give a dfa for language L = $\{ab^4wb^2 : w \in \{a, b\}^*\}$.

(10 marks)

(b) Find regular expression for the language accepted by the following automata.



(10 marks)

7. (a) Explain in detail about Chomsky hierarchy. (10 marks)

(b) Construct a Turing machine that accepts the complement of the language L = L $(aaaa^* b^*)$. Assume that $\sum \{a, b\}$.

(10 marks)

[5 × 20 = 100 marks]

C 81531

Name.....

Reg. No.....

FIRST SEMESTER M.C.A. DEGREE EXAMINATION, APRIL 2020

M.C.A.

MCA 18 104—DIGITAL FUNDAMENTALS AND MICROPROCESSORS

(2018 Admissions)

Time : Three Hours Maximum : 100 Marks

Answer any **five** *full questions.*
Each question carries 20 *marks.*

I. (a) Show the logic arrangements for implementing :

(a) a NOT circuit using a two-input NOR gate.

(b) a three-input NAND gate using two-input NAND gates.

(10 marks)

(b) Minimize the following logical function using K- Map and realize the result using only NAND gates assuming both complemented and un-complemented inputs are available.

$F(A,B,C,D) = \sum m(3,5,8,9,11,15)$ and $d(2,4,13,14)$. (10 marks)

II. (a) What are the two forms of Boolean expression ? (10 marks)

(b) What is a Flip Flop ? Explain the applications of T Flip Flop. (10 marks)

III. (a) Distinguish between FDM and TDM. (10 marks)

(b) Explain the working of a ripple counter. (10 marks)

IV. (a) Write notes based on 8086 :

a) Logical Address.

b) Data and address size in 8086.

c) M/IO in 8086. (10 marks)

(b) With suitable diagram explain flag registers in 8086. (10 marks)

V. (a) What are the addressing modes of 8086 ? Briefly explain each. (10 marks)

(b) Explain instruction sets in 8086. (10 marks)

VI. (a) Explain the structure of IO subsystem. (10 marks)

(b) What are 2 functional units of 8086 processor ? Explain. (10 marks)

VII. (a) Draw and explain the PIN diagram of 8086. (10 marks)

(b) Define hardware interrupt. Explain any 4 hardware interrupts. (10 marks)

[5 × 20 = 100 marks]

C 81530

Name.....

Reg. No.....

FIRST SEMESTER M.C.A. DEGREE EXAMINATION APRIL 2020

M.C.A.

MCA 18 103—PROGRAMMING IN C++

(2018 Admissions)

Time : Three Hours Maximum : 100 Marks

Answer **five** *full questions.*
Each question carries 20 *marks each.*

1. (a) Design an algorithm as well as flowchart for finding out largest number out of three given numbers.

   (b) Explain top-down and bottom-up approaches of programming.

2. (a) Discuss about dynamic binding in C++.

   (b) Differentiate between Call By Value and Call By Reference.

3. (a) Write a C++ program to reverse an array using pointers.

   (b) Explain the following :

   - This pointer.
   - New operator.
   - Delete operator.
   - Protected access specifier.

4. (a) Define operator overloading ? Explain how to overload unary operator and binary operator with examples.

   (b) What is Constructor ? Explain types of Constructor with example.

5. (a) Write a program to overload the '+' operator to concatenate two strings.

   (b) What is inheritance ? What are the different forms of inheritance ? Give an example of each.

6. (a) What is an exception ? How does it differ from an error ? With examples show how exceptions are thrown and caught in C++ ?

   (b) Write a note on function templates and explain how parameters are passed to function template with suitable example.

7. (a) What is class template ? Illustrate the use of class template with suitable example.

   (b) Write a C++ program to copy the contents of a text file to another.

C 81529 (Pages : 2) Name.....

Reg. No.....

FIRST SEMESTER M.C.A. DEGREE EXAMINATION, APRIL 2020

M.C.A.

MCA 18 102—PROBABILITY AND STATISTICS

(2018 Admissions)

Time : Three Hours Maximum : 100 Marks

Answer any **five** *questions.*
Each full question carries equal marks.

1. (a) When a die is thrown, ' X' denotes the number that turns up. Find E (X) and Var (X) ?

(10 marks)

(b) Find the M.G.F of binomial distribution and hence find mean and variance ? (10 marks)

2. (a) Pumpkins were grown under two experimental conditions. Two random samples of 11 and 9 pumpkins show the sample standard deviations of their weight as 0.8 and 0.5 respectively. Assuming that the weight distributions are normal, test hypothesis that the true variances are equal. (10 marks)

(b) A cigarette manufacturing firm claims that its brand A line of cigarettes outsells its brand B by 8%. If it is found that 42 out of a sample 200 smokers prefer brand A and 18 out of another sample of 100 smokers prefer brand B, test whether the 8% difference in a valid claim.

(10 marks)

3. (a) In a certain sample of 2000 families, 1400 families are consumers of tea. Out of 1800 Hindu families, 1236 families consume tea. Use ψ^2 test and state whether there is any significant differences between consumption of tea among Hindu and non-Hindu families.

(10 marks)

(b) In two large populations, there are 30% and 25% respectively of fair haired people. Is this difference likely to be hidden in sample of 1200 and 900 respectively from the two populations ? (10 marks)

4. (a) Fit a straight line (linear) trend to the data by the method of least squares :

Year	1979	1980	1981	1982	1983	1984	1985
Output (Rs. In crores)	672	824	968	1205	1464	1758	2058

(10 marks)

Turn over

(b) The two lines of regression are $8x - 10y + 66 = 0, 40x - 18y - 214 = 0$. The variance of 'X' is 9.

Find (i) The mean values of an 'X' and 'Y' ; (ii) $r(x, y)$; (iii) Find Var (Y) ? (10 marks)

5. (a) Three different machines are used for a production. On the basis of the outputs, set up one-way ANOVA Table and test whether the machines are equally effective :

Output		
Machine I	Machine II	Machine III
10	9	20
15	7	16
11	5	10
10	6	14

Given that the table value of F at 5% level of significance for (2, 9) df is 4.26.

(10 marks)

(b) Explain the steps for solving an ANOVA using Completely Randomised Design.

(10 marks)

6. (a) In a distribution exactly normal, 7% of the items are under 35 and 89% are under 63. What are the mean and standard deviation of the distribution ? (10 marks)

(b) Fit the model $y = ax^b$ to the following data :

x	1	2	3	4	5	6
y	2.98	4.26	5.21	6.10	6.80	7.5

(10 marks)

7. (a) A random sample of size 16 values from a normal population showed a mean of 53 and a sum of squares of deviation from the mean equals to 150. Can this be regarded as taken from the population having 56 as mean ? Obtain 95% confidence limits of the mean of the population ? (10 marks)

(b) Explain the three important phases of Design of Experiments. (10 marks)

[5 × 20 = 100 marks]

C 81528 (Pages : 2) Name.....

Reg. No.....

FIRST SEMESTER M.C.A. DEGREE EXAMINATION, APRIL 2020

M.C.A.

MCA 18 101—DISCRETE MATHEMATICAL STRUCTURES

(2018 Admissions)

Time : Three Hours Maximum : 100 Marks

Answer any **five** *questions.*
Each question carries equal marks.

1. (a) Prove that (i) $(A \cap B)^C = A^C \cup B^C$; (ii) $(A \cup B)^C = A^C \cap B^C$. (10 marks)

   (b) The survey was conducted among 1000 student, 595 like DM, 565 like POM, 550 like DSP, 395 like DM and POM, 350 like POM and DSP, 400 like DSP and DM and 250 like all th three subjects.

   (i) Find the number of students who like atleast one of the subjects

   (ii) How many of them like POM and do not like DM and DSP.

   (iii) How many of them who do not like DM, POM and DSP ?

   (10 marks)

2. (a) Obtain the PCNF of $S : (\neg P \rightarrow R) \wedge (Q \Leftrightarrow P)$. Hence obtain PDNF. (10 marks)

   (b) Verify the validity of the following argument.

   "Lions are dangerous animals. There are lions. They are dangerous animals".

   (10 marks)

3. (a) A lattice L is modular if and only if none of its sub lattices is isomorphic to the pentagon lattice N_5. (10 marks)

   (b) Consider the Boolean algebra D_{210}.

   (i) List is elements and draw its diagram.

   (ii) Find the set A of atoms.

   (iii) Find the two subalgebras with eight elements.

   (iv) Is $X = \{1, 2, 6, 210\}$ a sublattice of D_{210} ? A subalgebra ?

   (10 marks)

Turn over

4. (a) Show that group homomorphism preserves, identity, inverse and subgroup. (10 marks)

   (b) On the set Q of all rational numbers, the operation * is defined by $a * b = a + b - ab$. Show that, under this operation, Q is a commutative Monoid (10 marks)

5. (a) Prove that "A given connected graph G is an Euler graph if and only all vertices of G are of Even degree" (10 marks)

   (b) "A spanning tree T (of a given weighted connected graph G) is a shortest spanning tree (of G) if and only if there exists no other spanning tree (of G) at a distance of one from T whose weight is smaller than that T". (10 marks)

6. (a) Determine whether the relation R on the set of all integers is reflexive, symmetric, antisymmetric and / or transitive where $(x, y) \in R$ if and only if there exists :

   (i) $x = y + 1$ or $x = y - 1$; (ii) x is a multiple of y : (iii) $x = y^2$.

   (10 marks)

   (b) Using indirect method of proof, derive $P \rightarrow \neg S$ from

   $P \rightarrow Q \vee R, Q \rightarrow \neg P, S \rightarrow \neg R, P$. (10 marks)

7. (a) Let $\langle A, * \rangle$ be a group. Let $H = \{a \mid a \in G, a * b = b * a \forall b \in G\}$. Show that H is a normal subgroup. (10 marks)

   (b) State Dijkstra's algorithm to find the shortest path from a single source vertex to all other vertices in the given graph. (10 marks)

[5 × 20 = 100 marks]

C 81527

Name.....

Reg. No.....

FIRST SEMESTER M.C.A. DEGREE EXAMINATION, APRIL 2020

M.C.A.

MCA 10 105—PRINCIPLES OF SOFTWARE ENGINEERING

(2010 Admissions)

Time : Three Hours Maximum : 100 Marks

Answer any **five** *questions.*
Each question carries 20 marks.

1. (a) Describe the design process in software development. (10 marks)

   (b) Explain any two software process modals. (10 marks)

2. (a) Describe the main activities in the requirements engineering process. (10 marks)

   (b) Explain why systems developed as prototypes should not normally be used as production systems. (10 marks)

3. (a) List and explain in detail about rapid prototyping techniques. (10 marks)

   (b) Explain various domain specific architecture. (10 marks)

4. (a) Explain different type of control models. (10 marks)

   (b) Describe the process of object oriented design with an example. (10 marks)

5. (a) Explain object oriented integration testing with an example. (10 marks)

   (b) Illustrate the process involved in the Risk management. (10 marks)

6. (a) Explain in detail about Black box and white box testing. (10 marks)

   (b) Describe the different models in the COCOMO. (10 marks)

7. (a) What are the advantages and disadvantages of using a process maturity model ? (10 marks)

   (b) Describe three types of software process metric that may be collected as part of a process improvement. Give one example of each type of metric. (10 marks)

[5 × 20 = 100 marks]

C 81526

Name.....

Reg. No.....

FIRST SEMESTER M.C.A. DEGREE EXAMINATION, APRIL 2020

M.C.A.

MCA 10104—LOGIC DESIGN

Time : Three Hours Maximum : 100 Marks

Answer any **five** *full questions.*
Each question carries 20 *marks.*

1. a) Why NAND and NOR gates are called Universal gates ? Explain. (10 marks)

   b) Minimize the following Boolean function using K-map.

   $F = \Sigma (0, 4, 6, 8, 10, 15)$ (10 marks)

2. a) What is a half adder ? Write the truth table of a half adder. Implement a half adder using NAND gate.

   (10 marks)

   b) With neat circuit diagram explain what is multiplexer ? What are the applications of a multiplexer ?

   (10 marks)

3. a) What are the differences between synchronous and asynchronous counters ?

   (10 marks)

   b) Explain in detail about gray code counters. (10 marks)

4. a) With neat diagram explain the architecture of 8088. (10 marks)

   b) Explain in detail the processor control and iteration control instructions of 8086 with examples.

   (10 marks)

5. a) Briefly explain the features of 8086 microprocessor. (10 marks)

   b) Write an 8086 program to divide a 16 bit number by an 8 bit number. (10 marks)

6. a) What do you mean by DMA ? Explain about 8237 DMA controller. (10 marks)

   b) Explain about the pins of 8279 with a neat diagram. (10 marks)

7. a) What is an interrupt ? Explain in detail the different types of8086 interrupts. (10 marks)

   b) Explain in detail the PIN diagram of 8259 PIC. (10 marks)

[5 × 20 = 100 marks]

C 81525

Name.....

Reg. No.....

FIRST SEMESTER M.C.A. DEGREE EXAMINATION, APRIL 2020

M.C.A.

MCA 10 103—COMPUTER PROGRAMMING

(2010 Admissions)

Time : Three Hours Maximum : 100 Marks

Answer any **five** *questions.*
All full questions carry equal marks.

1) a) Design an algorithm as well as flowchart for finding out largest number out of three given numbers. (10 marks)

b) Explain different types of programming languages. (10 marks)

2) a) Write C program to print perfect numbers between given interval using function. (10 marks)

b) How will you pass a pointer to a function with an example ? (10 marks)

3) a) Explain STORAGE CLASS SPECIFIERS in C with example. (10 marks)

b) Write a C program to swap the content of two variables using pointers. (10 marks)

4) a) Write a C language program to add, list, delete record and modify the current record. (10 marks)

b) Write C program to convert decimal to binary number system using bitwise operator. (10 marks)

5) a) Write a C++ program to implement dynamic memory allocation. (10 marks)

b) Explain function overloading & operator overloading in detail. (10 marks)

6) a) Discuss the concepts of OOP. (10 marks)

b) Explain multiple inheritances with an example. (10 marks)

7) a) Discuss the applications of unary operators with examples. (10 marks)

b) Write a program using recursive function to find factorial of given number. (5 marks)

c) Find and justify the output of the following program.

```
main()
{
extern int i ; i = 20 ;
printf("%d",i);
}
```

(5 marks)

C 81524 (Pages : 4) Name.....

Reg. No.....

FIRST SEMESTER M.C.A. DEGREE EXAMINATION, APRIL 2020

M.C.A.

MCA 10 102—PROBABILITY AND STATISTICS

(2010 Admissions)

Time : Three Hours Maximum : 100 Marks

Answer any **five** *questions.*
Each full question carry equal marks.

1. (a) The probability distribution function of a random variable 'X' is : (10 marks)

$$f(x) = \begin{cases} x; & 0 < x < 1 \\ 2 - x; & 1 < x < 2 \\ 0; & x > 2 \end{cases}$$

Find the cumulative distribution function of X and also find its M.G.F ?

(b) In a large consignment of electric bulbs 10% are defective. A random sample of 20 is taken for inspection. Find the probability that

(i) All are good bulbs.

(ii) Atmost there are 3 defective bulbs.

(iii) Exactly there are 3 defective bulbs.

2. (a) Two random samples gave the following results. (10 marks)

Sample	*Size*	*Sample Mean*	*Sum of Squares of deviations from the mean*
1	12	14	108
2	10	15	90

Test whether the samples came from the same population.

(10 marks)

(b) A sample of 900 members has a mean 3.4 and s.d 2.61. Is the sample from a large population of mean 3.25 and s.d 2.61 ? Assuming population as normal, find the 95% confidence limits for its mean ?

(10 marks)

3. (a) From the following two sample values , find out whether the population variances .Differ significantly at 5 % level ?

Sample I : 17, 27, 18, 25, 27, 29, 27, 23, 17

Sample II : 16, 16, 20, 16, 20, 17, 15, 21

(10 marks)

(b) A die is thrown 264 times with the following results. Show that the die is biased.

No. Appeared on the die :	1	2	3	4	5	6
Frequency	40	32	28	58	54	52

(10 marks)

4. (a) A computer while calculating correlation co-efficient between 2 variables X, Y from 25 pairs of observations obtained the following results.

$n = 25, \sum x = 125, \sum x^2 = 650, \sum y = 100, \sum y^2 = 460, \sum xy = 508.$

However it was later found at the time of rechecking that had copied two pairs as :

X	Y
6	14
8	6

while the correct values are :

X	Y
8	12
6	8

Calculate the correct correlation co-efficient and the regression lines ?

(10 marks)

(b) Fit a parabolic curve to the following data using method of least squares.

X	1	2	3	4	5	6	7	8	9
y	2	6	7	8	10	11	11	10	9

(10 marks)

5. HDFC bank had four sales representatives , each of which was sent for a week into three Three types of area. Central Government Office , Primitive Companies , Multinational Company . Their taking in rupees/week are given below.

Types of Area	*Sales representation*			
	A	B	C	D
Central Government Office	30	70	30	30
Primitive Companies	80	50	40	70
Multinational Company	100	60	80	80

Discuss the difference between : (a) Sales representative ; (b) Areas. (Code the data by Substract 50 from each value and divide value by 10).

(20 marks)

6. The following table shows the lives in hrs. of four brands of electric lamps.

A : 1610, 1610, 1650, 1680, 1700, 1720, 1800.

B : 1580, 1640, 1640 , 1700, 1750.

C : 1460,1550,1600,1620,1640,1660,1740,1820.

D : 1510,1520,1530,1570,1600,1680.

Perform an analysis of variance and test the homogeneity of the mean lives of the 4 brand of lamps. (Code the data by subtracting 1640 from the given values).

(20 marks)

7. (a) Find the correlation co-efficient for the following data :

x	10	14	18	22	26	30
y	18	12	24	6	30	36

(10 marks)

(b) Two horses A and B were tested according to the time (in seconds) to run a particular track with the following results.

Horse A	28	30	32	33	33	29	34
Horse B	29	30	30	24	27	29	

Test whether the two horses have the same running capacity ?

(10 marks)

C 81523 (Pages : 3) Name.....

Reg. No.....

FIRST SEMESTER M.C.A. DEGREE EXAMINATION, APRIL 2020

M.C.A.

MCA 10 101—DISCRETE STRUCTURES

(2010 Admissions)

Time : Three Hours Maximum : 100 Marks

Answer any **five** *questions.*
All questions carry equal marks.

1. (a) Using proof by contradiction, show that $\sqrt{5}$ cannot be written as $\frac{a}{b}$ where a and $b(>0)$ are integers.

(8 marks)

(b) Disprove : if x any y are irrational numbers so is x^y. (12 marks)

2. (a) Using the truth table, prove the equivalence of $P \Rightarrow Q$ and $\sim P \vee Q$. (4 marks)

Also give examples to illustrate the above in all possible cases. (4 marks)

(b) Illustrate the properties of a relation by giving one example in each of the following cases : (Mention the relation and the set on which it is defined. Let the sets be one another different in your examples.) Also prove your claims.

i) A relation which is reflexive, not symmetric and not transitive.

ii) A relation which is not reflexive, symmetric and not transitive.

iii) A relation which is reflexive, symmetric and not transitive.

iv) A relation which is not reflexive, not symmetric and transitive.

v) A relation which is reflexive, not symmetric and transitive.

vi) A relation which is not reflexive, symmetric and transitive.

vii) A relation which is reflexive, symmetric and transitive.

viii) A relation which is not reflexive, not symmetric and not transitive.

(8 marks)

(c) Let $a, b \in A$, and R is an equivalence relation on A Let. Prove that two equivalence classes with respect to the relation R denoted by class (a) and class (b) are either same or disjoint.

(4 marks)

Turn over

3. (a) Let A be a finite set with n elements. Derive the expression for the total number of symmetric relations on A.

(5 marks)

(b) Using the Principle of inclusion - exclusion, prove that if $A_1, A_2, \ldots, A_n$ are finite sets, then

$$|A_1 \cup A_2 \cup \ldots \cup A_n| = \sum_1^n |A_i| - \sum_{1 \le i < j \le n} |A_i \cap A_j| + \sum_{1 \le i < j < k \le n} |A_i \cap A_j \cap A_k| - \ldots$$

$$+ (-1)^{n-1} |A_1 \cap A_2 \cap \ldots \cap A_n|.$$

(15 marks)

4. (a) Let N be the set of natural numbers and $Q = \{(a,b) | a,b \in N\}$. Give an example of a one-to-one function $f : Q \to N$. Is your function onto ? (6 marks)

(b) (i) Explain how one can prove that a set is infinite ? (7 marks)

(ii) Using your method, prove that the set of rational numbers is infinite. (7 marks)

5. (a) (i) Give an example of a partial order relation, which is not a totally ordered. (2 marks)

(ii) Construct the Hasse diagram of D_{30}, the set of all positive divisors of 30. (2 marks)

(b) (i) Prove that the Group G is commutative, if $a^{-1} = a$ for all a in G (2 marks)

(ii) Prove that, p is prime, if and only if $(p-1)! \equiv -1 \pmod{p}$. (10 marks)

(iii) Solve $x^3 \equiv 2 \pmod{83}$ using the fact that 3 does not divide 82, and Lagrange's Theorem.

(4 marks)

6. (a) Give the multiplication tables of groups of order 4, 5 and 6. (8 marks)

(b) Prove that if 5 is not a factor of the order of a Group, then the mapping $\varphi(g) = g^5$ from G to itself is one to one.

(4 marks)

(c) Define Ring. (1 mark)

(d) Give one example of a ring in each of the following cases :

i) A non-commutative ring without unity.

ii) A commutative ring without unity.

iii) A non-commutative ring with unity.

iv) A commutative ring with unity.

v) A non-commutative ring in which every element $a \neq 0$ has a multiplicative inverse, where 0 is the additive identity.

vi) A commutative ring in which every element a ($\neq$ 0, additive identity) has a multiplicative inverse.

vii) A finite integral domain.

(7 marks)

7. (a) Compute the inverse of the element 13 in F_{127}. (3 marks)

(b) Express all the polynomials of degree three or less in $F_2[x]$ as the powers of ∞, where ∞ is one of the roots of the irreducible polynomial $x^4 + x + 1$ $F_2[x]$ by constructing the field with 16 elements.

(7 marks)

(c) Prove that a finite integral domain is a field. (5 marks)

(d) Solve $x^2 \equiv 11 (\mathrm{mod}\, 127)$ using Lagrange's Theorem. (5 marks)

C 3324 (Pages : 2) Name.....

Reg. No.....

FIRST SEMESTER M.C.A. DEGREE (SUPPLEMENTARY) EXAMINATION APRIL 2021

M.C.A.

MCA 18 105—THEORY OF COMPUTATION

(2018 Syllabus)

Time : Three Hours Maximum : 100 Marks

Answer any **five** *questions.*

All full questions carry equal marks.

1. (a) Define a DFA. What are the different notations for a DFA?

   (b) Design a DFA to accept the language L = {w/w is of even length and begins with 01}. Construct the Transition table and Transition diagram for the same.

   (10 + 10 = 20 marks)

2. (a) Consider the grammar. S → SbS/a. This grammar is ambiguous. Show in particular that string abababa has two

      (i) Rightmost derivatives.

      (ii) Leftmost derivatives.

   (b) Write short notes on :

      (i) Parse Trees.

      (ii) CFG.

   (10 + 10 = 20 marks)

3. (a) Explain the complexity of converting among CFG's and PDA's.

   (b) Explain briefly Testing Membership in CFL.

   (10 + 10 = 20 marks)

4. Explain the following :

   (a) Multiple Turing machine.

   (b) Non-Deterministic Turing machine.

   (c) Multistack Turing machine.

   (d) Universal Turing machine.

   (20 marks)

Turn over

5. The following problems about Turing machine are undecidable :

   (a) Given a Turing machine M, is there any string at all on which M halts?

   (b) Given a Turing machine M, is the language that M semi decides regular? Is it context free? Is it recursive?

   (c) Given a Turing machine M, does M halt on every input string?

   (d) There is a certain fixed machine M, for which the following problem is undecidable. Given w, does M halt on w?

(20 marks)

6. (a) Explain briefly Deterministic PDA.

   (b) Construct a Turing machine which will accept the language consisting of all palindromes of 0's and 1's.

   (c) Construct the Transition diagram for the Turing machine which accepts the set of all palindromes over {0, 1}.

(10 + 5 + 5 = 20 marks)

7. Write short notes on :

   (a) YACC Parser-generator.

   (b) XML and document type definition.

(20 marks)

C 3323 **(Pages : 2)** **Name**.....

Reg. No.....

FIRST SEMESTER M.C.A. DEGREE (SUPPLEMENTARY) EXAMINATION APRIL 2021

M.C.A.

MCA 18 104—DIGITAL FUNDAMENTALS AND MICROPROCESSORS

(2018 Syllabus)

Time : Three Hours Maximum : 100 Marks

Answer any **five** *full questions.*
Each question carries 20 *marks.*

1. (A) What are universal gates? Explain its property with illustration.

   (B) Express the Boolean expression $f(x, y, z) = x + y z$ in SOP and POS form. Also give its minterm and maxterm.

   (C) Prove the Boolean theorem :

   (i) $x + x = x$.

   (ii) $x + x y = x$.

   (8 + 8 + 4 = 20 marks)

2. (A) Simplify using K-Map :

   Y = F (A, B, C, D) = (0, 2, 5, 7, 8, 10, 13, 15)

   (B) Explain the way in which negative numbers are represented in the computer.

   (C) Explain the standard forms of Boolean expressions.

   (8 + 8 + 4 = 20 marks)

3. (A) Explain how a full adder circuit can be converted to a full subtractor with the addition of one inverter circuit.

   (B) What is multiplexer? Draw the logic diagram and truth table of 4-to-IMUX.

   (C) What do you mean by serial shifting?

   (8 + 8 + 4 = 20 marks)

4. (A) Differentiate between asynchronous and synchronous counter.

   (B) Explain J-K flip-flop using proper logic diagrams and truth tables.

   (10 + 10 = 20 marks)

5. (A) Discuss the different addressing modes in 8086 microprocessors.

   (B) What is MASM? Explain the basic data types supported by MASM.

   (C) What is the purpose of a software model for a microprocessor?

   (8 + 8 + 4 = 20 marks)

Turn over

6. (a) Explain the five groups of interrupts supported in 8086 microprocessors.

   (b) Give an account on 8279 programmable keyboard and display controller.

(10 + 10 = 20 marks)

7. (a) Explain interrupt program context switch mechanism with suitable diagram.

   (b) Describe the functions of 8237 DMA controller with block diagram.

(10 + 10 = 20 marks)

C 3322 (Pages : 2) Name.....

Reg. No.....

FIRST SEMESTER M.C.A. DEGREE (SUPPLEMENTARY) EXAMINATION APRIL 2021

M.C.A.

MCA 18 103—PROGRAMMING IN C++

(2018 Syllabus)

Time : Three Hours Maximum : 100 Marks

Answer any **five** *full questions.*
Each question carries 20 *marks.*

1. (a) What do you mean by efficiency of an algorithm ? Explain the different methods for evaluating the efficiency of an algorithm.

(10 marks)

(b) Write down the algorithm for picking the largest elements in a list of N elements. Also give the time and space complexity of this algorithm.

(10 marks)

2. (a) Explain the basic concept of Object-Oriented Programming. (8 marks)

(b) Explain the difference between *call-by-value* and *call-by-reference* functions using suitable examples.

(8 marks)

(c) What are inline functions ? Explain its significance. (4 marks)

3. (a) Compare and contrast structure and class using examples. (8 marks)

(b) Explain the different access modifiers used in a class variable. (8 marks)

(c) Write a short note on dynamic memory allocation operators in C++. (4 marks)

4. (a) Explain different types of inheritance in C++ with examples. (12 marks)

(b) What do you mean by polymorphism ? Explain virtual function with example.

(8 marks)

5. (a) What are streams in C++ ? Explain predefined streams in C++. (8 marks)

(b) What are i/o manipulators ? Explain any five manipulators used for output.

(8 marks)

(c) Write C++ statement that will create an object called *fob* for writing and reading a file with file name DATA.

(4 marks)

Turn over

6. (a) **What are constructors and destructors ? Explain its significance in programming with illustration.**

(10 marks)

(b) **What is exception handing ? Explain with suitable examples.** **(10 marks)**

7. (a) **Write a C++ program to overload '+' and '–' operator to perform addition and subtraction of any two compatible matrix objects.**

(10 marks)

(b) Write a C++ program to create a class with members name, register number and two member functions for reading and displaying the name and register number of the students in a list. Dynamically allocate memory for creating a list of this type object and put name and register number of the students to these objects using member function for reading the data and finally release the memory used by these objects after displaying name and register number of the object created.

(10 marks)

[5 × 20 = 100 marks]

C 3321 (Pages : 2) Name.....

Reg. No.....

FIRST SEMESTER M.C.A. DEGREE (SUPPLEMENTARY) EXAMINATION APRIL 2021

M.C.A.

MCA 18 102—PROBABILITY AND STATISTICS

(2018 Syllabus)

Time : Three Hours Maximum : 100 Marks

Answer any **five** *full questions.*
Each question carries 20 *marks.*

1. (a) Define Poisson distribution and obtain its mean and variance. (10 marks)

   (b) Prove that Poisson distribution is a limiting case of Binomial distribution. (10 marks)

2. (a) Define Normal distribution and obtain its MGF. (10 marks)

   (b) If X_1 and has mean – 5 and variance 3 while X_2 has mean 1 and variance 4 and the two are independent, find

   (i) $E(3X_1 + 5X_2 + 2)$.

   (ii) Var $(3X_1 + 5X_2 + 2)$.

   (10 marks)

3. (a) Write a short note on Hypothesis testing. (10 marks)

   (b) Suppose that the length of certain machine parts may be looked upon as a random variable having a normal distribution with a mean of 2.000 cm. and a standard deviation of 0.050 cm. we want to test the null hypothesis $\mu = 2.000$ against the alterantive $\mu \neq 2.000$ on the basis of the mean of a random sample of size $n = 30$ if the probability of a type 1 error is to be $\alpha = 0.05$, what is the probability of type II error for $\mu = 2.010$. (10 marks)

4. (a) Explain estimation of proportions. (10 marks)

   (b) The following is the distribution of the hourly number of trucks arriving at a company's ware house :

Trucks arriving per hour	0	1	2	3	4	5	6	7	8
Frequency	52	151	130	102	45	12	5	1	2

   Find mean of this distribution, and using it (rounded to one decimal place) as the parameter λ, fit a Poisson distribution. Test for goodness of fit at the 0.05 level of significance.

   (10 marks)

Turn over

5. (a) Explain the term correlation and define correlation coefficient. (10 marks)

(b) The following are the measurements of the air velocity and evaporation coefficient of burning fuel droplets in an impulse engine :

Air velocity (cm/s) X	20	60	100	140	180	220	260	300	340	380
Evaporation coefficient ($mm.^2/s$) Y	0.18	0.37	0.35	0.78	0.56	0.75	1.18	1.36	1.17	1.65

Calculate correlation coefficient (r) for the data also assuming that the necessary assumptions can be met, test the null hypothesis $\rho = 0$ against the alternative $\rho \neq 0$ at the 0.05 level of significance.

(10 marks)

6. (a) Let $X_1, X_2 \ldots X_n$ be iid observations from $N(\mu, \sigma^2)$, derive the distribution of sample mean when σ is known.

(10 marks)

(b) The following are the average weekly losses of worker hours due to accidents in 10 industrial plants before and after a certain safety program was put into operations :

Before	45	73	46	124	33	57	83	34	26	17
After	36	60	44	119	35	51	77	29	24	11

Use the 0.05 level of significance to test whether the safety program is effective.

(10 marks)

7. (a) Develop the analysis of RBD. (10 marks)

(b) An experiment was designed to study the performance of 4 different detergents for cleaning fuel injectors. The following "cleanness" were obtained with specifically designed equipment for 12 tanks of gas distributed over 3 different models of engines :

	Engine I	Engine II	Engine III
Detergent A	45	43	51
Detergent B	47	46	52
Detergent C	48	50	55
Detergent D	42	37	49

Looking at the detergents as treatments and the engines as blocks obtain the appropriate analysis of variance table and test at the 0.01 level of significance whether there are differences in the detergence or in the engines.

(10 marks)

[5 × 20 = 100 marks]

C 3320 (Pages : 2) Name.....

Reg. No.....

FIRST SEMESTER M.C.A. DEGREE (SUPPLEMENTARY) EXAMINATION APRIL 2021

M.C.A.

MCA 18 101—DISCRETE MATHEMATICAL STRUCTURE

(2018 Syllabus)

Time : Three Hours Maximum : 100 Marks

Answer any **five** *full questions.*
All questions carry equal marks.

1. (a) Show that $|A \cup B| = |A| + |B| - |A \cap B|$ for any two sets A and B. (5 marks)

   (b) Simplify the expression $\left(\overline{(A \cup B) \cap C} \cup \overline{B}\right)^C$. (5 marks)

   (c) If R is a relation of $A = \{a_1, a_2, \ldots, a_n\}$, then show that $M_{R^2} = M_R \odot M_R$. (5 marks)

   (d) Let A = {1, 2, 3, 4} and R = {(1, 3), (1, 1), (3, 1), (1, 2), (3, 3), (4, 4)}. Find whether the relation is reflexive, irreflexive, symmetric and transitive. (5 marks)

2. (a) Define Conditional and Biconditional statements. Give example. (6 marks)

   (b) Show that the statement $((p \Rightarrow q) \wedge (q \Rightarrow r)) \Rightarrow (p \Rightarrow r)$ is a tautology. (5 marks)

   (c) Obtain Disjunctive normal forms of

   (i) $P \wedge (P \rightarrow Q)$; (ii) $\neg(P \vee Q) \rightarrow (P \wedge Q)$. (6 marks)

   (d) What are quantifiers ? Give example. (3 marks)

3. (a) Define partially ordered set and Hasse diagram. Let S = {*a*, *b*, *c*} then the power set $P(S) = \{\phi, \{a\}, \{b\}, \{c\}, \{a,b\}, \{a,c\}, \{b,c\}, \{a,b,c\}\}$ is a Poset with respect to the relation inclusion $\subseteq$. Draw the Hasse diagram. (6 marks)

   (b) State and prove the following laws of lattices :

   (i) Idempotent law ; (ii) Commutative law ; (iii) Associative law. (6 marks)

   (c) Show that (N, ≤) is a partialy ordered set, where N is the set of all positive integers and ≤ is a relation defined by $m \leq n$ if and only if $n - m$ is a non-negative integer. (8 marks)

Turn over

4. (a) Let G_1 and G_2 be subgroup of a group G :

(i) Show that $G_1 \cap G_2$ is also a subgroup of G.

(ii) Is $G_1 \cup G_2$ is always a subgroup of G.

(8 marks)

(b) For any integer m, show that $\{xm | x \in I\}$ is a subring of the ring of integers. (6 marks)

(c) State and prove Lagrange's theorem. (6 marks)

5. (a) Define Eulerian and Hamilton graph. Give an example of a graph which is :

(i) Eulerian but not Hamiltonian. (ii) Hamiltonian but not Eulerian.

(iii) Both Eulerian and Hamiltonian. (iv) Non-Eulerian and Non-Hamiltonian.

(10 marks)

(b) Write a note on the following :

(i) Kruskal's algorithm.

(ii) Path, cycles and connectivity of a graph.

(10 marks)

6. (a) Define principle of inclusion and exclusion. Find the number of integers between 1 and 250 both inclusive that are divisible by any of the integers 2, 3, 5 and 7.

(6 marks)

(b) If all the vertices of an undirected graph are each of degree k, show that the number of edges of the graph is a multiple of k.

(5 marks)

(c) Prove $\neg(A \vee B)$ and $[(\neg A) \wedge (\neg B)]$ are equivalent. (5 marks)

(d) Let $f(x) = x + 2$ and $g(x) = 2x + 1$, find $(fog)(x)$ and $(gof)(x)$. (4 marks)

7. Explain the following :

(i) Inverse functions. (ii) Equivalence formula.

(iii) Normal forms. (iv) Cyclic groups.

(4 × 5 = 20 marks)

C 3319

Name.....

Reg. No.....

FIRST SEMESTER M.C.A. DEGREE (SUPPLEMENTARY) EXAMINATION APRIL 2021

M.C.A.

MCA 10 105—PRINCIPLES OF SOFTWARE ENGINEERING

(2010 Syllabus)

Time : Three Hours | Maximum : 100 Marks

Answer any **five** *questions.*

1. (a) What is the difference between SRS document and design document? What are the contents we should contain in the SRS document and design document.

   (b) What is data modeling? Give 5 examples for data modeling.

   (10 + 10 = 20 marks)

2. (a) Explain in detail about the incremental model and spiral model.

   (b) What are the purposes of Data Flow diagrams, Entity-Relationship diagrams? Give an Example of each diagram.

   (10 + 10 = 20 marks)

3. (a) Explain all the phases involved in the implementation phase.

   (b) What are the Requirements Engineering Process Functions? Explain.

   (10 + 10 = 20 marks)

4. (a) List and explain different type of rapid prototyping techniques.

   (b) Explain different type of user interface evaluation techniques.

   (10 + 10 = 20 marks)

5. (a) List and explain different types of testing done during the testing phase.

   (b) What is user acceptance testing? Explain different testing in user acceptance testing. Why is it necessary?

   (10 + 10 = 20 marks)

6. (a) List and Explain Objectives and features supported by SCM.

   (b) Explain component based development model.

   (10 + 10 = 20 marks)

7. (a) Explain different type of CMMI models with neat diagram.

   (b) List and Explain different types of technical and non-technical factors affect the maintenance process.

   (10 + 10 = 20 marks)

C 3318

Name.....

Reg. No.....

FIRST SEMESTER M.C.A. DEGREE (SUPPLEMENTARY) EXAMINATION APRIL 2021

M.C.A.

MCA 10 104—LOGIC DESIGN

(2010 Syllabus)

Time : Three Hours | Maximum : 100 Marks

Answer any **five** *full questions.*
Each question carries 20 *marks.*

1. (a) Prove that AND gate is associative and commutative.

   (b) Minimize the following Boolean function using K map :

   $F = \Sigma (0, 1, 3, 5, 6, 9, 11, 12, 13, 15)$

   (10 + 10 = 20 marks)

2. (a) What is a decoder? Implement a $2 * 4$ binary decoder using AND gate.

   (b) Explain in detail about synchronous counters. Design a binary 4-bit synchronous up counter.

   (10 + 10 = 20 marks)

3. (a) With an example, explain the steps in converting binary to Gray code. Draw the logic circuit used to convert binary to gray code.

   (b) Explain in detail about shift registers.

   (10 + 10 = 20 marks)

4. (a) With neat diagram, explain the architecture of 8086.

   (b) Explain in detail the program execution transfer instructions of 8086 with examples.

   (10 + 10 = 20 marks)

5. (a) Explain about 8255. What are the features of 8255?

   (b) With neat a block diagram, explain 8254 programmable interval timer.

   (10 + 10 = 20 marks)

6. (a) Explain about 8250 UART.

   (b) How does 8279 keyboard works? Describe the architecture of 8279.

   (10 + 10 = 20 marks)

7. (a) What are hardware interrupts in 8086? Explain the different hardware interrupt pins of 8086.

   (b) Describe the differences between maskable and non-maskable interrupts.

   (10 + 10 = 20 marks)

C 3317

Name.....

Reg. No.....

FIRST SEMESTER M.C.A. DEGREE (SUPPLEMENTARY) EXAMINATION APRIL 2021

M.C.A.

MCA 10 103—COMPUTER PROGRAMMING

(2010 Syllabus)

Time : Three Hours | Maximum : 100 Marks

Answer any **five** *questions.*
Each full questions carry equal marks.

1. (a) Explain the General Structure of CPU.
   (b) Explain top-down analysis with an example.

   (10 + 10 = 20 marks)

2. (a) Write a detailed note on array and its operations.
   (b) Write a program showing the use of if else and switch statements in C.

   (10 + 10 = 20 marks)

3. (a) What is a pointer? Explain how the pointer variable declared and initialized.
   (b) What is dynamic memory allocation? Write and explain the different dynamic memory allocation functions in C.
   (c) Write a detailed note on 2D array and implement it in matrix addition program.

   (4 + 6 + 10 = 20 marks)

4. (a) State and explain various modes of file opening and file closing.
   (b) Write C program to check even or odd using bitwise operator.
   (c) Explain the class to basic type conversion with an example.

   (10 + 5 + 5 = 20 marks)

5. (a) What is the need for parameterized constructors? Explain the function of constructors with their declaration and definition inside a class.
   (b) Explain data Encapsulation and Inheritance in detail.

   (10 + 10 = 20 marks)

6. (a) Explain call by value and call by reference with example.
   (b) State the important features of object oriented programming. Compare object oriented programming with procedure oriented programming.

   (10 + 10 = 20 marks)

7. (a) Explain the control structures of C++.
   (b) Write a note on the template function. Develop program codes to sort a list of numbers in alphabetical order.

FIRST SEMESTER M.C.A. DEGREE (SUPPLEMENTARY) EXAMINATION, APRIL 2021

M.C.A.

MCA 10 102—PROBABILITY AND STATISTICS

(2010 Syllabus)

Time : Three Hours Maximum : 100 Marks

Answer any **five** *questions.*
Each full question carry equal marks.

1. (a) Find the value of 'k' and hence find mean and variance of the distribution :

$$dF = kx^2e^{-x}\,dx,\ x > 0.$$

(10 marks)

(b) Find the M.G.F. of Geometric distribution and hence find the mean and variance.

(10 marks)

2. (a) The following are the gains in weights (in gms) of rats fed on two different diets D_1 and D_2. Gain in weights :

Diet D_1 : 25, 32, 30, 34, 24, 14, 32, 24, 30, 31, 35, 25

Diet D_2 : 44, 34, 22, 10, 47, 31, 40, 30, 32, 35, 18, 21, 35, 29, 22.

Test if the two diets differ significantly as regards their effect on increase in weights.

(10 marks)

(b) A simple sample of heights of 6400 English men has a mean of 170 cm. and a s.d. of 6.4 cm. while a simple sample of heights of 1600 Americans has a mean of 172 cm. and as.d. of 6.3 cm. Do the data indicate that Americans are on the average taller than the Englishmen ? (10 marks)

3. (a) Random samples of 400 men and 600 women were asked whether they would like to have a school near their residence. 200 men and 325 women were in favour of the proposal. Test the hypothesis that the proportion of men and women in favour of the proposal are same, at 5 % level of significance. (10 marks)

(b) The theory predicts the proportion of beans, in the four groups A, B, C and D should be 9 : 3 : 3 : 1. In an experiment with 1600 beans, the number in the four groups were 882, 313, 287 and 118. Does the experimental result support the theory. (10 marks)

4. (a) Fit a straight line trend of the form $y = a + bx$ to the data given below by the method of least squares and predict the value of y when $x = 70$. (10 marks)

x	71	68	73	69	67	65	66	67
y	69	72	70	70	68	67	68	64

(b) From the following data, find the two regression equations and the corresponding correlation coefficient : (10 marks)

Marks in Economics	25	28	35	32	31	36	29	38	34	32
Marks in Statistics	43	46	49	41	36	32	31	30	33	39

5. (a) Explain the basic steps required for the analysis of variance in CRD. (10 marks)

(b) A completely Randomised Design experiments with 10 plots and 3 treatments gave the following result. Anlayse the result for treatment effects :

Plot No.	1	2	3	4	5	6	7	8	9	10
Treatment	A	B	C	A	C	C	A	B	A	B
Yield	5	4	3	7	5	1	3	4	1	7

(10 marks)

6. (a) 10 competitors in a musical test were ranked by the 3 judges X, Y, Z in the following order :

	A	B	C	D	E	F	G	H	I	J
Rank by X	1	6	5	10	3	2	4	9	7	8
Rank by Y	3	5	8	4	7	10	2	1	6	9
Rank by Z	6	4	9	8	1	2	3	10	5	7

Use rank correlation method, discuss which pair of judges has the nearest approach to common liking of music.

(10 marks)

(b) Prove "Pisson distribution is a limiting case of Binomial distribution". (10 marks)

7. (a) A random sample of size 16 values from a normal population showed a mean of 53 and a sum of squares of deviation from the mean equals to 150. Can be sample be regarded as taken from the population having 56 as means ? Obtain 95% confidence limits of the mean of the population ?

(10 marks)

(b) In two large populations, there are 30 % and 25 % respectively of fair haired people. Is this difference likely to be hidden in samples of 1200 and 900 respectively from the two populations.

(10 marks)

[5 × 20 = 100 marks]

FIRST SEMESTER M.C.A. DEGREE (SUPPLEMENTARY) EXAMINATION, APRIL 2021

M.C.A.

MCA 10 101—DISCRETE STRUCTURES

(2010 Syllabus)

Time : Three Hours Maximum : 100 Marks

Answer any **five** *full questions.*
Each question carries 20 *marks.*

1. (a) Using proof by contradiction, show that $\sqrt{2}$ cannot be written as $\frac{a}{b}$ where a and $b(\neq 0)$ are integers.

(8 marks)

(b) By using prove or disprove : If x and y are irrational numbers, then x^y is an irrational number.

(12 marks)

2. (a) Let P and Q are two propositions, then prove the equivalence of $P \Rightarrow Q$ and $\sim P \vee Q$. Give examples to illustrate the above in all possible cases.

(8 marks)

(b) Illustrate the properties of a relation by giving one example in each of the following cases: (Mention the relation and the set on which it is defined. Let the sets be one another different in each cases). Also justify your answer :

(i) A relation which is reflexive, not symmetric and not transitive.

(ii) A relation which is not reflexive, symmetric and not transitive.

(iii) A relation which is reflexive, symmetric and not transitive.

(iv) A relation which is not reflexive, not symmetric and transitive.

(v) A relation which is reflexive, not symmetric and transitive.

(vi) A relation which is not reflexive, symmetric and transitive.

(vii) A relation which is reflexive, symmetric and transitive.

(viii) A relation which is not reflexive, not symmetric and not transitive.

(8 marks)

(c) Let A be a finite set and m denotes the total number of equivalence relations on A and the total number of partitions of A respectively. Prove that $m = n$.

(4 marks)

Turn over

3. (a) Let A be a finite set with n elements. Derive the expression for the total number of relations on A.

(5 marks)

(b) Prove that if $A_1, A_2, \ldots, A_n$ are finite sets, then

$$|A_1 \cup A_2 \cup \ldots \cup A_n| = \sum_1^n |A_i| - \sum_{1 \le i < j \le n} |A_i \cap A_j| +$$

$$\sum_{1 \le i < j < k \le n} |A_i \cap A_j \cap A_k| - \ldots + (-1)^{n-1} |A_1 \cap A_2 \cap \ldots \cap A_n|.$$

(15 marks)

4. (a) Let P and E be the set of positive integers and positive even integers respectively. Give an example of a one-to-one function $f : P \to E$. Is your function onto ?

(6 marks)

(b) A set S is said to be infinite if there is a one-to-one correspondence between S and a proper subset of S. Prove :

(i) The set of integers is infinite. (7 marks)

(ii) The set of real numbers is infinite. (7 marks)

5. (a) (i) Define partial order relation. (2 marks)

(ii) Construct the Hasse diagram of D_{30}, the set of all positive divisors of 30.

(2 marks)

(b) (i) Prove that the Group G is commutative, if $(ab)^2 = a^2b^2$ for all a, b in G. (2 marks)

(ii) State and prove Lagrange's theorem. Also justify whether the converse true.

(10 marks)

(iii) Solve $x^3 \equiv 5 \pmod{47}$ using the fact that 3 does not divide 46 and Lagrange's Theorem.

(4 marks)

6. (a) Give the multiplication tables of groups of order 4, 5 and 6. (8 marks)

(b) Prove that if 3 is not a factor of the order of a group, then the mapping $\varphi(g) = g^3$ from G to itself is one to one.

(c) Define Ring. (4 marks)

(d) Give one example of a ring in each of the following cases : (1 mark)

(i) A non-commutative ring without unity.

(ii) A commutative ring without unity.

(iii) A non-commutative ring with unity.

(iv) A cummutative ring with unity.

(v) A non-commutative ring in which every element $a \neq 0$ has a multiplicative inverse, Where 0 is the additive identity.

(vi) A commutative ring in which every element a ($\neq$ 0, additive identity) has a multiplicative inverse.

(vii) A finite integral domain.

(7 marks)

7. (a) Compute the inverse of the element 13 in F_{47}. (3 marks)

(b) Express all the polynomials of degree three or less in $F_2[x]$ as the powers of $\propto$, where $\propto$ is one of the roots of the irreducible polynomial $x^4 + x + 1$ $F_2[x]$ by constructing the field with 16 elements.

(7 marks)

(c) Prove that a finite integral domain is a field. (5 marks)

(d) Solve $x^2 \equiv 14 \pmod{47}$ using Lagrange's Theorem. (5 marks)

[5 × 20 = 100 marks]