

**FIRST SEMESTER M.C.A. (LATERAL ENTRY) DEGREE
[SUPPLEMENTARY] EXAMINATION, APRIL 2021**

M.C.A. (Lateral Entry)

MCA L18 105—COMPUTER ARCHITECTURE

Time : Three Hours

Maximum : 100 Marks

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

1. (a) Explain the software tools used for parallel programming.
(b) What do you mean by instruction level parallelism ? Write the important approaches available to exploit parallelism.
2. (a) Discuss the basic pipeline scheduling and loop unrolling with the help of an example.
(b) Describe in brief the architecture of a vector processor? Explain how can it be Implemented.
3. (a) Distinguish between SISD, SIMD, MISD, MIMD architectures.
(b) What are the interconnection networks ? Draw and explain the mapping three-dimensional hypercube with suitable example.
4. (a) Explain the synchronization techniques used in multiprocessors.
(b) What is meant by memory hierarchy ? Explain with a neat diagram.
5. (a) Give an account on VLSI matrix arithmetic processors.
(b) Compare and contrast Von Neumann and dataflow computers.
6. (a) Describe the roles played by various registers in a SIMD processor.
(b) Explain how do you define the terms measure and summarize performance of a Computer.
7. (a) Explain major classes of Pipeline hazards.
(b) What is meant by parallel processing? Briefly explain Flynn's classification of parallel computers.

(5 × 20 = 100 marks)

**FIRST SEMESTER M.C.A. (LATERAL ENTRY) DEGREE
[SUPPLEMENTARY] EXAMINATION, APRIL 2021**

M.C.A. (Lateral Entry)

MCA L18 104—ADVANCED DBMS

Time : Three Hours

Maximum : 100 Marks

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

1. (a) Explain the three levels architecture of databases. (10 marks)
(b) Describe the naming convention and notations used in ER diagrams. (10 marks)
2. (a) Explain the use of HAVING and GROUP BY clause in SQL with example. (10 marks)
(b) Give brief account on Postgres SQL and SQLite database systems. (10 marks)
3. (a) Why does concurrency control mechanism is needed ? Explain lost update, inconsistent retrievals and uncommitted dependency anomalies. (8 marks)
(b) Explain two-phase locking protocol in detail. (8 marks)
(c) What is a timestamp ? State its advantages. (4 marks)
4. (a) What is Data Mining ? Explain the differences between data mining and knowledge discovery. (10 marks)
(b) Explain the architecture of distributed database management systems. (10 marks)
5. (a) Give an account on database web service using suitable example. (10 marks)
(b) What is cloud computing ? Explain the features of virtualization. (6 marks)
(c) Compare private and public cloud. (4 marks)
6. (a) Explain the various operators used in Relational Algebra. (10 marks)
(b) Explain the ACID properties of transaction. (10 marks)
7. (a) What is spatial database ? Explain the different types of spatial database with examples. (8 marks)
(b) Compare and contrast BCNF and 3NF. (8 marks)
(c) Differentiate AWS and Firebase. (4 marks)

[5 × 20 = 100 marks]

**FIRST SEMESTER M.C.A. DEGREE (LATERAL ENTRY)
[SUPPLEMENTARY] EXAMINATION, APRIL 2021**

M.C.A. (Lateral Entry)

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) Let $A = \{n \in \mathbb{N} : 20 \leq n \leq 50\}$ and $B = \{n \in \mathbb{N} : 10 < n \leq 30\}$. Suppose C is a set such that $C \subseteq A$ and $C \subseteq B$. What is the largest possible cardinality of C ?
(4 marks)
- (ii) Let $A = \{1, 2, 3, 4, 5\}$, $B = \{3, 4, 5, 6, 7\}$, and $C = \{2, 3, 5\}$. (a) Find $A \cap B$; (b) Find $A \cup B$; (c) Find $A - B$; (d) Find $A \cap B \cup C$.
(6 marks)
- (B) (i) Let $A = \{1, 2, 3, 4, 5, 6\}$. Find all sets $B \in P(A)$ which have the property $\{2, 3, 5\} \subseteq B$.
(5 marks)
- (ii) Explain principles of inclusion and exclusion using example.
(5 marks)
2. (A) (i) Analyze the statement, "if you get more doubles than any other player you will lose, or that if you lose you must have bought the most properties," using truth table.
(5 marks)
- (ii) Show that $p \vee q \rightarrow r \equiv (p \rightarrow r) \wedge (q \rightarrow r)$ using logical equivalences.
(3 marks)
- (iii) Explain dual of a proposition.
(2 marks)
- (B) (i) Without the truth table Find the PDNF AND PCNF of $\neg((P \vee Q) \wedge R) \wedge (P \vee R)$.
(5 marks)
- (ii) Using inference rule from the set of sentences given below Prove the following conclusion :
- (a) "It's not sunny and it's colder than yesterday".
- (b) "We will go swimming only if it's sunny."

Turn over

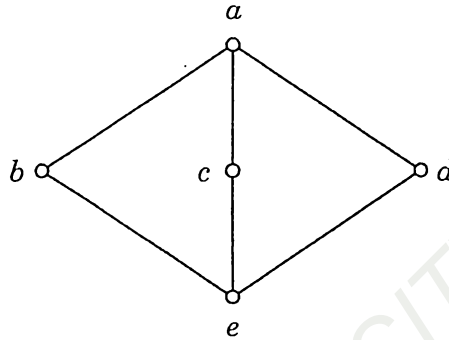
(c) "If we don't go swimming then we will take canoe trip."

(d) "If we take a canoe trip, then we will be home by sunset."

Conclusion: "We will be home by sunset."

(5 + 5 = 10 marks)

3. (A) (i) The following is the Hasse diagram of the poset $\{a, b, c, d, e, \leq\}$. Show that it is a lattice.



(5 marks)

- (ii) Use Boolean algebra to simplify the following expression : $A \cdot B + A \cdot (B + C)$.

(5 marks)

- (B) Show that if S is a collection of propositions with finite propositional variables then (S, \vee, \wedge) is a Boolean algebra.

(10 marks)

4. (A) (i) Let $(G, *)$ be a group in which the square of every element is the identity. Show that G is abelian.

(5 marks)

- (ii) Let G, H be groups, G_0 a subgroup of G , H_0 a subgroup of H , and $\varphi: G \rightarrow H$ a homomorphism. Show that $\varphi(G_0) = \{\varphi(x); x \in G_0\}$ is a subgroup of H .

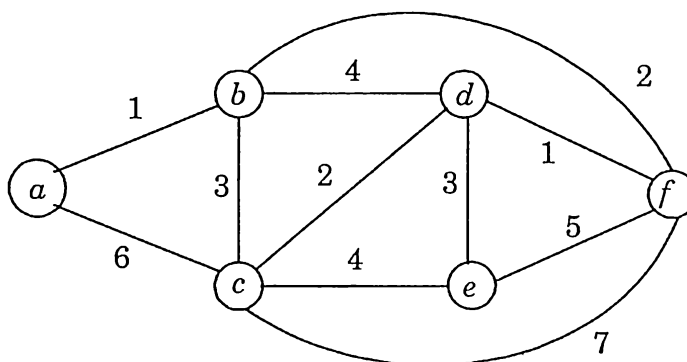
(5 marks)

- (B) Determine whether $(Z, @, \cdot)$ is a ring with operations $x @ y = x + y$, $x \cdot y = x + y - 3xy$ for all $x, y \in Z$.

(10 marks)

5. (A) Construct a minimum spanning tree using Kruskal's algorithm.

(10 Marks)



(B) Explain the following graph :

(i) Bipartite Graph.

(ii) Isomorphic Graph.

(iii) Regular Graph.

(iv) Planar Graph.

(10 marks)

6. (A) (i) If R be a relation from $A = \{1, 2, 3, 4\}$ to $B = \{1, 3, 5\}$ that is $(a, b) \in R \Leftrightarrow a < b$ then find $R \circ R^{-1}$.

(5 marks)

(ii) In a college of 100 students, 35 play football, 36 row and 24 play tiddlywinks. 13 play football and row, 2 play football and tiddlywinks but never row, 12 row and play tiddlywinks, while 4 practice all three activities. How many students participate in none of the activities of football, rowing and tiddlywinks ?

(5 marks)

(B) Explain Equivalence Relation. Let R be an equivalence relation on a nonempty set A , and let $a, b \in A$. Prove that $[a] = [b]$ if and only if $a R b$.

(10 marks)

7. (A) (i) If $f(x) = x^2 - 4x + 2$ and $g(x) = 3x - 7$, find $f \circ g(x)$.

(3 marks)

(ii) Let $f : A \rightarrow B$ and $g : B \rightarrow A$. Prove that function g is equal to f^{-1} only if $g \circ f = I_A$ and $f \circ g = I_B$.

(7 marks)

Turn over

(B) (i) Let $a, b \in \mathbb{R}$ with $b \neq 0$. Define $f: \mathbb{R} - \{0\} \rightarrow \mathbb{R} - \{a\}$ by $f(x) = a + b/x$. Prove that f is bijective.

(3 marks)

(ii) Let R be a partial ordering of the set of all divisors of 64. Construct the hasse diagram for it. Find the meet and join.

(7 marks)

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**FIRST SEMESTER M.C.A. (LATERAL ENTRY) DEGREE
[SUPPLEMENTARY] EXAMINATION, APRIL 2021**

M.C.A. (Lateral Entry)

MCA L18 102—PROGRAMMING IN JAVA

Time : Three Hours

Maximum : 100 Marks

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

1. (a) Explain the concept of inheritance and its types in Java. (10 marks)
(b) Describe the salient features of Object Oriented Programming Languages. (10 marks)
2. (a) Explain the differences between method overloading and method over-riding with examples. (10 marks)
(b) What are constructors ? Explain the implementation of different types of constructors in Java with examples. (10 marks)
3. (a) Describe the synchronization in respect of multithreading. (10 marks)
(b) What is the difference between an error and an exception ? Explain the purpose of the *finally* clause of try-catch-finally statement. (10 marks)
4. (a) Write an applet program in Java to accept two different strings as input and display the concatenated form of the strings as output. (10 marks)
(b) Explain the hierarchy of input stream classes in Java. (10 marks)
5. (a) What is JDBC ? Explain the architecture of JDBC. (10 marks)
(b) Explain the steps for creating TCP/IP sockets in Java for communicating between TCP client and server. (10 marks)
6. (a) Define an exception called *No Match Exception* that is thrown when a string is not equal to "India". Write a program that uses this exception. (10 marks)
(b) What is an Interface ? Explain the needs and properties of Interface in Java. (10 marks)
7. (a) Write a Java program to add two matrices using operator overloading. (10 marks)
(b) Explain any two control structures in Java with examples. (10 marks)

(5 × 20 = 100 marks)

**FIRST SEMESTER M.C.A. (SPECIAL) SUPPLEMENTARY DEGREE
EXAMINATION, SEPTEMBER 2017****MCA 2K 105—INDUSTRIAL MANAGEMENT****(2000 Syllabus Year)**

Time : Three Hours

Maximum : 100 Marks

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

1. (a) Describe Public sector organisation with its merits and limitations. Which are the different types of public sector organization ?
(b) Write notes on :
 - (i) Controlling.
 - (ii) Motivation.
2. (a) Explain in detail about EOQ models.
(b) Describe the principles of plant layout. Explain process layout with its advantages and disadvantages.
3. (a) What do you understand by supply chain management ? Who are the main participants of supply chain management ?
(b) What do you mean by recruitment ? Which are the different sources of recruitment ?
4. (a) Briefly explain the different types of incentive plans.
(b) What do you understand by job evaluation ? What are the objectives of job evaluation ?
5. (a) Define advertising. What are the features and advantages of advertising ?
(b) Write notes on ISO 9000.
6. (a) What is job analysis ? What is the need of job analysis in personnel management ?
(b) Define co-ordination. What are the principles of co-ordination ?
7. (a) Define job evaluation. Explain in detail the non-analytical methods used for job evaluation.
(b) Write notes on the process of organizing in management.

[5 × 20 = 100 marks]

**FIRST SEMESTER M.C.A. (SPECIAL) SUPPLEMENTARY DEGREE
EXAMINATION, SEPTEMBER 2017**

MCA 2K 102.—PROBABILITY AND STATISTICS

(2000 Syllabus Year)

Time : Three Hours

Maximum : 100 Marks

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

1. (a) State any four properties of Normal Distribution. In a distribution exactly normal, 7 % of the items are under 35 and 39 % are under 63. What are the mean and standard deviation of the distribution ?
(10 marks)
- (b) A random variable X has a uniform distribution over $(-3, 3)$. Compute :
(i) $P(X < 2)$, $P(|X| < 2)$, $P(|X - 2| < 2)$.
(ii) Find k for which $P(X > k) = 1/3$.
(10 marks)
2. (a) If 10 % of the screws produced by an automatic machine are defective, find the probability that out of 20 screws selected at random, there are (i) Exactly 2 defective; (ii) atmost 3 defectives ; (iii) atleast 2 defectives ; (iv) between 1 and 3 defectives (inclusive).
(10 marks)
- (b) Find the moment generating function of Gamma distribution and hence find mean and variance.
(10 marks)
3. (a) Explain clearly the different types of estimation. (10 marks)
- (b) Two random samples gave the following results :—

Sample	Size	Sample Mean	Sum of the squares of deviations from the mean
I	10	15	90
II	12	14	108

Test whether the samples could have come from the same normal population.

(10 marks)

Turn over

4. (a) 1000 students at college level were graded according to their I.Q and their economic conditions. What conclusion can you draw from the following data :—

Economic conditions	I.Q. Level	
	High	Low
Rich	460	140
Poor	240	160

(10 marks)

- (b) Random samples of 400 men and 600 women were asked whether they would like to have a flyover near their residence. 200 men and 325 women were in favour of the proposal. Test the hypothesis that proportions of men and women in favour of the proposal, are same against that they are not, at 5 % level.

(10 marks)

5. (a) Find the correlation coefficient between industrial production and export using the following data :—

Production X	55	56	58	59	60	60	62
Export Y	35	38	37	39	44	43	44

(10 marks)

- (b) Fit a straight line trend to the data by the method of least squares :

Year	1979	1980	1981	1982	1983	1984	1985
Output	672	824	968	1205	1464	1758	2058

(10 marks)

6. (a) Height of fathers and sons are given in centimeters :

x : Height of Father	150	152	155	157	160	161	164	166
y : Height of Son	154	156	158	159	160	162	161	164

Find the two lines of regression and calculate the expected average height of the son when the height of the father is 154 cm.

(10 marks)

- (b) Test the hypothesis that there is no correlation between air-quality levels and the incidence of pulmonary disease in the world's cities against the alternative that there is association between them. For a sample size of $n = 11$ cities, $r_s = 0.736$. Use $\alpha = 0.05$.

(10 marks)

7. (a) Explain the Statistical analysis of Completely Randomised Design. (10 marks)
- (b) Three varieties A, B, C of a crop are tested in R.B.D. with 4 replications. The plot yield in pounds are as follows :

A6	C5	A8	B9
C8	A4	B6	C9
B7	B6	C10	A6

Analyse the experimental yield and state your conclusions.

(10 marks)

[5 × 20 = 100 marks]



**FIRST SEMESTER M.C.A. (SPECIAL) SUPPLEMENTARY DEGREE
EXAMINATION, SEPTEMBER 2017**

MCA 2K 101—DISCRETE STRUCTURES

(2000 Syllabus Year)

Time : Three Hours

Maximum : 100 Marks

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

1. (a) Define tautology and contradiction. Prove that $(\neg p \rightarrow q) \rightarrow (q \rightarrow p)$ is neither a tautology nor a contradiction. (10 marks)
 (b) Demonstrate the validity of the argument :

$$P \rightarrow R, \neg P \rightarrow Q, Q \rightarrow S \rightarrow \neg R \rightarrow S.$$
(10 marks)
2. (a) Determine the number of integers between 1 and 250 that are not divisible by 2, 3, or 5. (10 marks)
 (b) Let $X = \{1, 2, 3, \dots, 7\}$ and $R = \{x, y / x - y \text{ is divisible by } 3\}$. Show that R is an equivalence relation and hence draw the graph of R . (10 marks)
3. (a) State and prove consistency laws in a lattice. (10 marks)
 (b) Draw the Hasse diagram for the following :—
 (i) $[P(A), \subseteq]$ where $A = \{1, 2, 3\}$.
 (ii) $(D_{30}, /)$ where $D_{30} = \{1, 2, 3, 5, 6, 10, 15, 30\}$, the set of divisors of 30. (10 marks)
4. (a) Show that a group $(G, *)$ is abelian iff $(a * b)^2 = a^2 * b^2$. (10 marks)
 (b) State and prove Lagrange's theorem on groups. (10 marks)
5. (a) Show that $(Z_6, +_6, X_6)$ is a commutative ring. (10 marks)
 (b) Prove : Z_n is an integral domain iff n is prime. (10 marks)

6. (a) Give examples of :
- (i) a finite commutative ring with identity which is not an integral domain.
 - (ii) a finite non-commutative ring.
 - (iii) an infinite non-commutative ring with identity.
 - (iv) an infinite ring having no identity.
- (10 marks)
- (b) Prove : Let R be a ring and I be a subgroup of $(R, +)$. The multiplication in R/I given by $(I + a)(I + b) = I + ab$ is well defined iff I is an ideal of R .
- (10 marks)
7. (a) Prove : Any Euclidean domain R is a UFD. (10 marks)
- (b) Prove : If F' is any other field containing D , then F' contains a subfield isomorphic to F . (10 marks)
- [5 × 20 = 100 marks]

**FIRST SEMESTER M.C.A. DEGREE (SUPPLEMENTARY) EXAMINATION
APRIL 2022**

M.C.A.

MCA 18 105—THEORY OF COMPUTATION

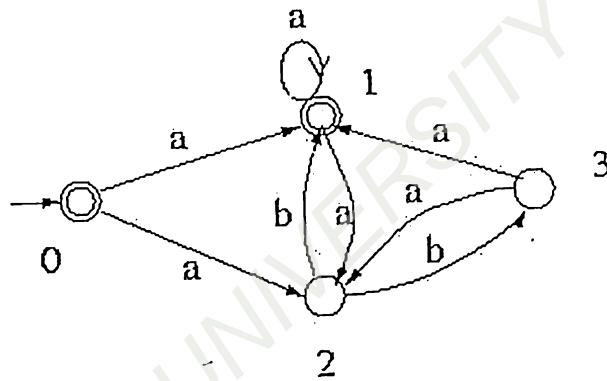
(2018 Syllabus Year)

Time : Three Hours

Maximum : 100 Marks

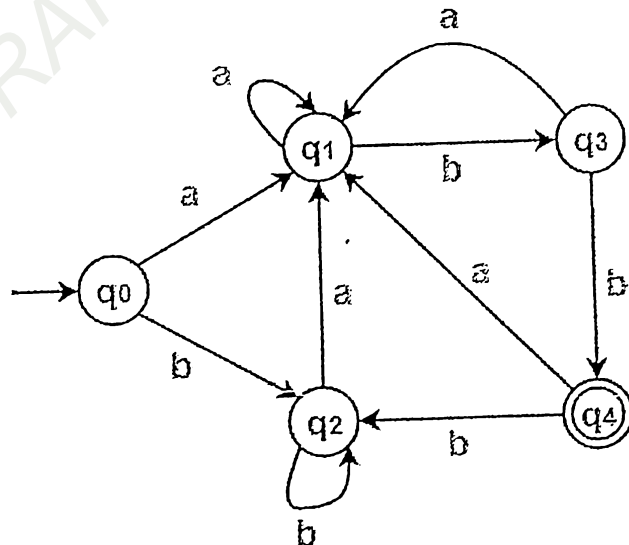
*Answer five full questions.
Each question carries 20 marks.*

1. (a) Convert the following NFA to DFA. Write down the steps for 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 the regular expression $r = 0^* 1 (0 + 1)^*$. (5 marks)
- (b) Consider the grammar :

$$\begin{aligned} S &\rightarrow A1B \\ A &\rightarrow 0A \mid \epsilon \\ B &\rightarrow 0B \mid 1B \mid \epsilon. \end{aligned}$$

For the string $w = 00101$, find :

- (i) Leftmost derivation.
- (ii) Rightmost derivation.
- (iii) Parse tree and also check whether the grammar is ambiguous or not.

(15 marks)

3. (a) Give pushdown automata that recognize the following language :

$$B = \{w \in \{0, 1\}^* \mid w = w^R \text{ and the length of } w \text{ is odd}\}.$$

(10 marks)

- (b) State and prove the pumping lemma for CFL. (10 marks)

4. (a) Write about Universal Turning Machines. (10 marks)

- (b) Construct Turing machine that will accept the following language on :

$$\{a, b\}L = \{w : n_a(w) = n_b(w)\}.$$

(10 marks)

5. (a) Briefly explain about The Clique Problem. And prove that it belongs to class of NP problems.

(10 marks)

- (b) Write down about polynomial time reduction and with an example show that the SAT problem is polynomial-time reducible to 3SAT.

(10 marks)

6. (a) Find context-free grammars for the following languages ($n \geq 0, m \geq 0, k \geq 0$):

(i) $L = \{a^n b^m : n \text{ (not =) } m - 1\}$.

(ii) $L = \{w \in \{a, b\}^* : n_a(v) \geq n_b(v), \text{ where } v \text{ is any prefix of } w\}$.

(10 marks)

(b) (i) Eliminate all unit-productions, all useless productions, and all λ -productions from the grammar :

$$S \rightarrow aA \mid aBB, A \rightarrow aaA \mid \lambda, B \rightarrow bBbbC, C \rightarrow B.$$

(ii) Eliminate all unit-productions from :

$$S \rightarrow a \mid aA \mid B \mid C, A \rightarrow aB \mid \lambda, B \rightarrow Aa, C \rightarrow cCD, D \rightarrow ddd.$$

(10 marks)

7. (a) Explain in detail about deterministic and non-deterministic push down automata with examples.

(10 marks)

(b) Write in detail about Linear Bounded Automata.

(10 marks)

[5 × 20 = 100 marks]

**FIRST SEMESTER M.C.A. DEGREE (SUPPLEMENTARY) EXAMINATION
APRIL 2022**

M.C.A.

MCA 18 104—DIGITAL FUNDAMENTALS AND MICROPROCESSORS

(2018 Syllabus Year)

Time : Three Hours

Maximum : 100 Marks

Answer any five full questions.

Each carries 20 marks.

- I. (a) What are the basic logic elements explain each with suitable truth table and diagram ?
(10 marks)
- (b) Find $65_{10} - 25_{10}$ using one's complement format with 8-bit numbers. Then convert the result back to decimal.
(10 marks)
- II. (a) What are two different types of shift register counters ? Explain each. (10 marks)
- (b) In what situation multiplexing is used ? What are the goals of multiplexing ?
(10 marks)
- III. (a) What are the advantages of microcontroller based system design ? Explain. (10 marks)
- (b) List and briefly explain the types of instructions in instruction set of 8086. (10 marks)
- IV. (a) Write an ALP using 8086 instructions to count the numbers of zeros in a given 8 bit number and store the result in memory location 'Res'.
(10 marks)
- (b) For an 8086 microprocessor explain odd-addressed byte transfer and even-addressed word transfer.
(10 marks)

Turn over

- V. (a) Identify the addressing modes of the following instructions. Also find the physical address of the memory location being accessed by the instruction. Assume DS = 2300h, SS = 3597h, SI = 1393H, BX = 2345H, BP = ABC2H, SP = 2ADEH :
- i) MOV CX, [BX+23H].
 - ii) SUB DX, [BP].
 - iii) ADD [2323H], BL.
- (10 marks)
- (b) Write an assembly language program to count number of vowels in a given string.
- (10 marks)
- VI. (a) Give an overview about the Internal Architecture of 8086. (10 marks)
- (b) Explain different minimum mode signals in 8086 architecture. (10 marks)
- VII. (a) What are the various interrupts in 8086 ? Explain each. (10 marks)
- (b) Explain in detail about 8259 PIC. (10 marks)

[5 × 20 = 100 marks]

**FIRST SEMESTER M.C.A. DEGREE (SUPPLEMENTARY) EXAMINATION
APRIL 2022**

M.C.A.

(2018 Syllabus Year)

MCA 18 103—PROGRAMMING IN C++

Time : Three Hours

Maximum : 100 Marks

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

1. (i) Explain top down and bottom up modular programming with real word examples.
(ii) Develop an algorithm and flowchart for printing all prime numbers less than a given number.
2. (i) Enumerate and explain different object oriented concepts. Relate each of the concepts with a real life example and a C++ programming constructs.
(ii) Write a program to illustrate the concept of call by value and call by reference. Also explain how it works.
3. (i) Explain the concept of user defined data types in connection with structure, class and enumeration in C++.
(ii) Write a program to find the largest, smallest and second largest element in an array using pointers.
4. Write a program to create a class Bank Account having data members 'account number, account holder name, balance amount ' and member functions to initialize the data members, deposit amount and print the details and an abstract function 'withdraw'. Derive two classes 'Saving Account and Current Account' having new data members 'minimum balance and overdraft amount' respectively. Override the withdraw function in the child classes in such a way that 'Saving Account' should check for minimum balance while withdraw and Current Account should allow overdraft amount to be withdrawn.
5. (i) Explain exception handling in C++.
(ii) Explain different file operations in C++.
6. (i) Write a C++ program to overload '+' operation for string calculation.
(ii) Explain in detail about function templates
7. (i) Explain different string handling functions in C++.
(ii) Write note on constructors and destructors in C++. Clearly illustrates the need of constructor overloading.

**FIRST SEMESTER M.C.A. DEGREE (SUPPLEMENTARY) EXAMINATION
APRIL 2022**

M.C.A.

MCA 18 102—PROBABILITY AND STATISTICS

(2018 Syllabus Year)

Time : Three Hours

Maximum : 100 Marks

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

1. a) Define expectation of a random variable. (10 marks)
- b) Define Normal distribution. Find its mean and variance. (10 marks)
2. a) Define Binomial distribution. Find its mean and variance. (10 marks)
- b) When a relay tower for wireless phone service breaks down, it quickly becomes an expensive proposition for the phone company, and the cost increases with the time it is inoperable. From company records, it is postulated that the probability is 0.90 that the breakdown can be prepared within one hour. For the next three breakdowns, on different days and different towers.
 - i) List all possible outcomes in terms of success, S, repaired within one hour, and failure F. not repaired within one hour. (5 marks)
 - ii) Find the probability distribution of the number of successes among the three repairs. (5 marks)
3. a) Let X_1, X_2, \dots, 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 random samples are measurements of the heat producing capacity (in millions of calories per ton) of specimens of coal from two mines :

Mine 1	8260	8130	8350	8070	8340	-
Mine 2	7950	7890	7900	8140	7920	7840

Use the 0.01 level of significance to test whether the difference between the means of these two samples is significant.

(10 marks)

Turn over

4. a) Explain Bayesian estimation. (10 marks)
- b) Test of the fidelity and the selectivity of 190 digital radio receivers produced the results shown in the following table :

		Fidelity		
		Low	Average	High
Selectivity	Low	6	12	32
	Average	33	61	18
	High	13	15	0

Use the 0.01 level of significance to test whether there is a relationship (dependence) between fidelity and selectivity.

(10 marks)

5. a) Calculate co-efficient of correlation between X and Y for the following :

X	1	3	4	5	7	8	10
Y	2	6	8	10	14	16	20

(10 marks)

- b) Describe curvilinear regression. (10 marks)

6. Explain analysis of covariance. Give the complete statistical analysis of ANCOVA. (20 marks)

7. a) Explain the method of ordinary least square for solving linear regression model. (10 marks)

- b) The following table shows how many weeks a sample of six persons have worked at an automobile inspection station and the number of cars each one inspected between noon and 2P.M. on a given day.

Number of weeks employed (X)	2	7	9	1	5	12
Number of cars inspected (Y)	13	21	23	14	15	21

Find the equation of the least square line which will enable us to predict Y in terms of X.

(10 marks)

[5 × 20 = 100 marks]

**FIRST SEMESTER M.C.A. DEGREE (SUPPLEMENTARY) EXAMINATION
APRIL 2022**

M.C.A.

MCA 18 101—DISCRETE MATHEMATICAL STRUCTURES

(2018 Syllabus Year)

Time : Three Hours

Maximum : 100 Marks

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

I. (a) The results of a survey reveal that out of 87 subscribers, 68 have a windows based system available with them, 34 have a UNIX system available, and 30 have access to a Mac. In addition 19 have access to both windows and UNIX system, 11 have access to both UNIX and Mac and 23 can use both Mac and Windows. Use the principle of inclusion and exclusion to determine :

(i) How many subscribers have access to all 3 types of systems.

(ii) How many integers not exceeding 500 are divisible by 7 or 11 ?

(10)

(b) Simplify the following using set identities:

(i) $(\bar{A} \cup \bar{B}) \cup (A \cap B \cap \bar{C})$.

(ii) $(A \cap B) \cup (B \cap ((C \cap D) \cup (C \cap D)))$.

2. (a) Show that $R \wedge (P \vee Q)$ is a valid conclusion from the premises.

$$P \vee Q, Q \rightarrow R, P \rightarrow M \text{ and } \neg M.$$

(b) Show the following argument is valid.

“My father praises me only if I can be proud of myself. Either I do well in sports or I can't be proud of myself. If study hard, then I cannot do well in sports. Therefore, if father praises me, then I do not study well.”

3. (a) Prove: "Every chain is a Distributive Lattice."
- (b) Show that $(P(A), \cup, \cap, \leq)$ is a Boolean algebra and also show that in any Boolean algebra,
 $(a + b)(a' + c) = ac + a'b + bc$.
4. (a) Let $\langle A, * \rangle$ be a group. Let $H = \{a / a \in G, a * b = b * a \forall b \in G\}$. Show that H is a normal subgroup.
- (b) Show that every finite semigroup has idempotent elements ?
5. (a) P.T. " A simple graph with n vertices, there are k components can have atmost $(n - k)(n - k + 1)/2$ edges".
- (b) "Every circuit has an even number of edges in common with any cut-set". Prove.
6. (a) "A connected graph G is an Euler graph if and only if it can be decomposed into circuits". Prove.
- (b) Show that $(x)(P(x) \vee Q(x)) \Rightarrow (x)P(x) \vee (\exists x)Q(x)$.
7. (a) State and prove Isotomicity property is a lattice.
- (b) Among 50 students in a class, 26 got an A in the first examination and 21 got A in the second examinations. If 17 students did not get an A in either examinations, how many students got an A in both examinations ?

(5 × 20 = 100 marks)

**FIRST SEMESTER M.C.A. DEGREE (SUPPLEMENTARY) EXAMINATION
APRIL 2022**

M.C.A.

MCA 10 105—PRINCIPLES OF SOFTWARE ENGINEERING
(2010 Syllabus Year)

Time : Three Hours

Maximum : 100 Marks

Answer any five questions.

1. (a) Write in detail about requirements engineering process. (12 marks)
(b) Explain the various functional and non-functional requirements. (8 marks)
2. (a) Explain the various life cycle models. (10 marks)
(b) Illustrate the process of validation management. (10 marks)
3. (a) Describe rapid prototyping techniques. (12 marks)
(b) Explain any *two* different type of system model. (8 marks)
4. (a) Describe how unit testing and integration testing is conducted for object oriented software. (12 marks)
(b) Explain object oriented design process. (8 marks)
5. (a) What are different activities in user interface design process. (12 marks)
(b) Explain different types of integration testing approaches. (8 marks)
6. (a) Explain the fundamental software design concepts in detail. (12 marks)
(b) Describe component based development. (8 marks)
7. (a) Describe various types of CMMI models. (10 marks)
(b) Explain the process involved in software project management. (10 marks)

**FIRST SEMESTER M.C.A. DEGREE (SUPPLEMENTARY) EXAMINATION
APRIL 2022**

M.C.A.

MCA 10104—LOGIC DESIGN

(2010 Syllabus Year)

Time : Three Hours

Maximum : 100 Marks

Answer five full questions.

Each full question carries 20 marks.

1. a) State and prove De-Morgan's laws using logic gates.
b) Minimize the following Boolean function using k map :
$$F = \sum (0, 3, 4, 6, 7, 9, 12, 14, 15).$$
2. a) What is an Encoder ? Implement a 4×2 encoder using OR gate and write the truth table.
b) Explain in detail about Asynchronous counters. Design a binary 4 bit asynchronous up counter.
3. a) What are Excess-3 codes ? Explain with an example the steps in converting BCD to Excess-3 codes.
b) Explain in detail about the different types of shift registers.
4. a) What are the differences between 8086 and 8088 ?
b) Explain in detail the Data Transfer and arithmetic instructions of 8086 with examples.
5. a) Describe the concept of Assembly language Programming with MASM.
b) Explain in detail the addressing modes of 8088.
6. a) With neat diagram explain the architecture of 8255 PPI.
b) Explain about the operational mode of 8279.
7. a) What are the differences between hardware and software interrupts ?
b) Explain in detail about 8051 microcontroller.

(5 × 20 = 100 marks)

**FIRST SEMESTER M.C.A. DEGREE (SUPPLEMENTARY) EXAMINATION
APRIL 2022**

M.C.A.

MCA 10 103—COMPUTER PROGRAMMING

(2010 Syllabus Year)

Time : Three Hours

Maximum : 100 Marks

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

1. (a) Define high level language over machine language? Explain advantages and disadvantages. (10 marks)
- (b) Explain the use printf and scanf function with example. (5 marks)
- (c) Discuss the steps involved in program verification. (5 marks)
2. (a) List and Explain Data types of C. (6 marks)
- (b) Write a C program to print the size of basic data types. (4 marks)
- (c) What is Recursion ? Write a program for finding first 10 Fibonacci numbers using recursion ? (6 marks)
- (d) Differentiate Actual and Formal Arguments with respect to user defined functions. (4 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 program to input any number from user and count number of trailing zeros in the given number using bitwise operator. (10 marks)
- (b) Explain any *five* string manipulation library functions with examples. (10 marks)

Turn over

5. (a) List out the difference between procedure oriented programming and Object oriented programming. (10 marks)
- (b) Write a C++ program to overload +operator to add two complex numbers. (10 marks)
6. (a) Write an algorithm for swapping two elements without using an extra temporary Variable. (10 marks)
- (b) Write a C program to convert a given decimal number to binary. (10 marks)
7. Find and justify the output of the following programs :

(i) main()

```
{
char *q;
for(j=0;j<3;j++) scanf("%s",(q+j));
for(j=0;j<3;j++) printf("%c",(q+j));
for(j=0;j<3;j++) printf("%s",(q+j));
}
```

(ii) main()

```
{
char s[]="man"; int i;
for(i=0;s[i];i++)
printf("\n%c%c%c%c",s[i],*(s+i),*(i+s),i[s]);
}
```

(iii) main()

```
{
char *p="hai friends",*pl; pl=p;
while(*p!='\0') ++*p++; printf("%s %s",p,pl);
}
```

```
(iv) main()
{
int i=1; while (i<=5)
{
printf("%d",i); if (i>2)
goto here; i++;
}}
fun()
{
here:
printf("PP");}
```

(4 × 5 = 20 marks)

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**FIRST SEMESTER M.C.A. DEGREE (SUPPLEMENTARY) EXAMINATION
APRIL 2022**

M.C.A.

MCA 10102—PROBABILITY AND STATISTICS

(2010 Syllabus Year)

Time : Three Hours

Maximum : 100 Marks

Answer any five questions.

Each full question carry equal marks.

1. (a) A random variable X has the following probability function :

x	0	1	2	3	4	5	6	7
$P(x)$	0	k	$2k$	$2k$	$3k$	k^2	$2k^2$	$7k^2 + k$

Find (i) k ; (ii) $P(X < 6)$, $P(X \geq 6)$, $P(0 < X < 5)$; (iii) If $P(X \leq K) > 0.5$, find the minimum Value of "K" ; and (iv) Determine the distribution function of X.

- (b) The mean yield for one-acre plot is 662 kilos with a s.d. 32 kilos. Assuming Normal distribution, how many one-acre plots in a batch of 1000 plots would you expect to have yield (i) Over 700 kilos ; (ii) Below 650 kilos ; (iii) What is the lowest yield of the best 100 plots ?
2. (a) The mean yield of wheat from a district A was 210 pounds with s.d. 10 pounds per Acre from a sample of 100 plots. In another district the mean yield was 220 pounds with s.d. 12 pounds from a sample of 150 plots. Assuming that the s.d. of yield in the entire state was 11 pounds, test whether there is any significant difference between the mean yield of crops in the two districts.
- (b) A certain stimulus administered to each of the 12 patients resulted in the following Increase of blood pressure : 5, 2, 8, - 1, 3, 0, - 2, 1, 5, 0, 4 and 6. Can it be concluded that the stimulus will, in general, be accompanied by an increase in blood pressure ?
3. (a) A manufacturing firm claims that its brand A product outsells its brand B Product by 8 % . If it is found that 42 out of a sample of 200 persons prefer brand A and 18 out of another sample of 100 persons prefer brand B. Test whether the 8 % difference is a valid claim.

Turn over

- (b) Given the following contingency table for hair colour and eye colour. Is there good association between the two :

		Hair Colour			Total
		Fair	Brown	Black	
Eye Colour	Blue	15	5	20	40
	Grey	20	10	20	50
	Brown	25	15	20	60
	Total	60	30	60	150

4. (a) The two lines of regression are $8x - 10y + 66 = 0$, $40x - 18y - 214 = 0$. The variance of 'x' is 9. Find (i) mean values of x and y ; (ii) $r(x, y)$; and (iii) variance of 'y' ?

- (b) Fit an equation of the form $y = a b^x$ to the following data using method of least squares :

x	2	3	4	5	6
y	144	172.8	207.4	248.8	298.5

5. (a) Explain the three basic principles of Experimental Designs.
- (b) The four samples below have been obtained from normal populations with equal variances. Test the hypothesis that the populations means are equal using one-way analysis of variance at 1 % level ?

Sample I	15	17	14	11		
Sample II	12	10	13	17	14	
Sample III	14	09	07	10	08	07
Sample IV	10	14	13	15	12	

6. (a) Certain pesticide is packed into bags by a machine. A random sample of 10 bags is Drawn and their contents are found to weight (in kg.) as follows :

50, 49, 52, 44, 45, 48, 46, 45, 49, 45. Test if the average packing can be taken to be 50 kg.

- (b) Obtain the rank correlation co-efficient for the following data :

x	68	64	75	50	64	80	75	40	55	64
y	62	58	68	45	81	60	68	48	50	70

7. (a) The following data relate to the marketing expenditure and the corresponding sales. Estimate the marketing expenditure to obtain a sales target of Rs. 40 crores using the regression lines :

Marketing Expenditure	10	12	15	20	23
Sales	14	17	23	21	35

- (b) A sample analysis of examination results of 500 students was made. It was found that 220 students had failed , 170 had secured a third class, 90 were placed in second class and 20 got a first class. Do these figures commensurate with the general examination result which is in the ratio of 4:3:2:1 for the various categories respectively.

**FIRST SEMESTER M.C.A. DEGREE (SUPPLEMENTARY) EXAMINATION
APRIL 2022**

M.C.A.

MCA 10101—DISCRETE STRUCTURES

(2010 Syllabus Year)

Time : Three Hours

Maximum : 100 Marks

Answer any five questions.

Each question carries 20 marks.

1. a) Without constructing the truth table, show that :

$$(i) \quad \neg(P \wedge Q) \rightarrow (\neg P \vee (\neg P \vee Q)) \Leftrightarrow \neg P \vee Q; \text{ and}$$

$$(ii) \quad (P \vee Q) \wedge (P \wedge (P \vee Q)) \Leftrightarrow \neg P \wedge Q.$$

b) Test for the validity of the following argument using truth table method.

“If Ram studies, then he will pass Discrete Mathematics. If Ram doesn't play tennis, then he will study. Ram failed in Discrete Mathematics. Therefore Ram Plays tennis”.

2. a) Prove that (i) $(A \cap B)^c = A^c \cup B^c$; and (ii) $(A \cup B)^c = A^c \cap B^c$.

b) Define the term Relation. Let R be a relation, with $M_R = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}$. Find the matrices that

represents (i) R^2 ; (ii) R^3 ; (iii) R^{-1} ; and (iv) \bar{R} .

3. a) Let $f: \mathbb{R} \rightarrow \mathbb{R}$ and $g: \mathbb{R} \rightarrow \mathbb{R}$ where \mathbb{R} is the set of real numbers given by

$f(x) = x^2 - 2$, and $g(x) = x + 4$. Find $f \circ g$ and $g \circ f$. State whether these functions are injective , surjective and bijective.

b) State and prove Reversal law for inverse functions.

Turn over

4. a) Prove that the intersection of two subgroups of a group G is also a subgroup of G .
 b) Prove "Any cyclic group is abelian". Is the converse true. Justify your answer.
5. a) Show that $(\mathbb{Z}_6, +_6, \times_6)$ is a commutative ring.
 b) Prove that the set $R = \{0, 1, 2\}$ is a field with respect to addition modulo 3 and multiplication modulo 3.
6. a) Show that the given formula is an implication :

$$((P \vee \neg Q) \rightarrow Q) \rightarrow ((P \vee \neg P) \rightarrow R) \Rightarrow (Q \rightarrow R).$$

- b) Prove that the set F of all real numbers of the form $a + b\sqrt{2}$, where $a, b \in \mathbb{Q}$ is a field under the usual addition and multiplication of real numbers.
7. a) Consider the sets $X = \{1, 2, 3, 4\}$ and $Y = \{a, b, c\}$.

$$\text{Let } f_1 = \{(1, a), (2, a), (3, b), (4, c)\}$$

$$f_2 = \{(1, a), (1, b), (2, a), (3, b), (4, b)\}$$

$$f_3 = \{(1, b), (2, b), (3, b), (4, c)\}$$

$$f_4 = \{(1, a), (2, b), (3, c)\}$$

- (i) Which of the f_1 's are functions from X to Y . What are their ranges ?
- (ii) Which of these f_1 's are onto functions ?
- (iii) Which of these f_1 's are one-one onto functions ?
- (iv) If some f_1 's is not a function, explain why is not so ?
- b) In a survey of 100 students, it was found that 40 studied Mathematics, 64 studied Physics, 35 studied Chemistry, 1 studied all the three subjects, 25 studied Mathematics and Physics, 3 studied Mathematics and chemistry and 20 Studied Physics and Chemistry. Find the number of students who studied chemistry only and the number of students who studied none of these subjects.

**FIRST SEMESTER M.C.A. DEGREE (REGULAR/SUPPLEMENTARY)
EXAMINATION, NOVEMBER 2021**

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) Define an entity. What is an EER model and how to represent supertype and subtype relationships.
(B) Explain BCNF and 5th normal form with examples.
(10 + 10 = 20 marks)
2. Write a note on :
a) Embedded SQL ; b) Postgres SQL ; c) SQ Lite ; and d) Spatial Databases.
(4 × 5 = 20 marks)
3. (A) Explain the Properties of Transaction
(B) Explain concurrency control in databases.
(10 + 10 = 20 marks)
4. (A) Define SQL, Schema, nested query and group by clause with examples for each.
(B) Explain various data types used in SQL and pL/SQL.
(10 + 10 = 20 marks)
5. (A) Explain advantages and disadvantages of distributed DBMS.
(B) Discuss in detail about integrity rule in relational data model.
(10 + 10 = 20 marks)
6. (A) Explain about DML commands in SQL with examples.
(B) What are the responsibilities of a Database Administrator ?
(10 + 10 = 20 marks)
7. (A) What is the purpose of XML in web service ?
(B) Explain OODBMS concept.
(10 + 10 = 20 marks)
[5 × 20 = 100 marks]

**FIRST SEMESTER M.C.A. DEGREE (REGULAR/SUPPLEMENTARY)
EXAMINATION, NOVEMBER 2021**

MCA

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) What is the Underlying Assumption in Artificial intelligence ? Explain an AI Technique.
(B) Explain production system characteristics in AI
2. (A) Explain Best-first search algorithm and its strategy.
(B) Explain AO algorithm with backward propagation.
3. (A) With examples Illustrate representing simple facts in logic.
(B) Explain Computable functions and predicates with an example.
4. (A) Explain Knowledge reasoning with logical agents.
(B) What is Reinforcement learning ? explain with a suitable diagram.
5. (A) Explain Additional Refinements in Game Playing.
(B) Explain expert system life cycle with examples of expert system.
6. (A) Explain the predictable calculus and inference rules in AI.
(B) Describe Means-Ends Analysis Algorithm.
7. (A) Write short notes on : (i) Forward Vs Backward reasoning ; and (ii) Matching.
(B) Describe Expert system tools with important features and usage of MYCIN and DENDRAL.

(5 × 20 = 100 marks)

**FIRST SEMESTER M.C.A. DEGREE (REGULAR/SUPPLEMENTARY)
EXAMINATION, NOVEMBER 2021**

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) Use principle of inclusion or exclusion to solve the following :

In a conference held in Mumbai, 500 delegates attended it. 200 of them would take tea, 350 would take coffee and 10 did not take either tea or coffee.

- i) How many can take both tea and coffee ?
- ii) How many can take tea only ?
- iii) How many can take coffee only ?

(10 marks)

- (B) Let f and g be the functions from the set of integers to the set of integers defined by $f(x) = 2x + 3$ and $g(x) = 3x + 2$. What is the composition of f and g ? What is the composition of g and f ?

(10 marks)

2. (A) What is a simple proposition and compound proposition ? Explain with example. (10 marks)

- (B) Show that the compound statements $(\sim P \wedge (\sim Q \wedge R)) \vee (Q \wedge R) \vee (P \wedge R)$ and R are equivalent.

(5 marks)

- (C) Construct the truth table for $(p \rightarrow q) \wedge (q \rightarrow p)$.

(5 marks)

Turn over

3. (A) Show that in a lattice if $a \leq b \leq c$ then $a \oplus b = b * c$ and $(a * b) \oplus (b * c) = b = (a \oplus b) * (a \oplus c)$.
(10 marks)
- (B) Determine whether the posets $(\{1, 2, 3, 4, 5\}, |)$ and $(\{1, 2, 4, 8, 16\}, |)$ are lattices.
(5 marks)
- (C) Explain the properties of lattices.
(5 marks)
4. (A) Determine whether $(z, +, \cdot)$ is a ring with binary operation.
(10 marks)
- (B) Define : i) Isomorphism ; ii) Homomorphism ; and iii) Automorphism.
(10 marks)
5. Explain the following with examples :
(A) Regular Graph ; (B) Bipartite Graph ; (C) Isomorphism of graphs ; and (D) Hamiltonian Graph.
(4 × 5 = 20 marks)
6. (A) Show that $\sim (P \Leftrightarrow Q)$ and $(\sim P \Leftrightarrow Q)$ are logically equivalent.
(10 marks)
- (B) $A = \{2, 3, 4\}$, $B = \{1, 2\}$ find $A + B$, $B + C$, $A + B + C$.
(10 marks)
7. (A) Obtain PCNF and PDNF of $(P \rightarrow (Q \wedge R)) \wedge (\sim P \rightarrow (\sim Q \wedge \sim R))$.
(10 marks)
- (B) Draw a graph with the adjacency matrix $\begin{bmatrix} 0 & 1 & 0 \\ 0 & 1 & 0 \\ 0 & 1 & 1 \end{bmatrix}$.
(5 marks)
- (C) Determine whether the posets $(\{1, 2, 3, 4, 5\}, |)$ and $(\{1, 2, 4, 8, 16\}, |)$ are lattices.
(5 marks)

**FIRST SEMESTER M.C.A. DEGREE (REGULAR/SUPPLEMENTARY)
EXAMINATION, NOVEMBER 2021**

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) What is inheritance explain difference form of inheritance in java ? (10 marks)
(B) Write a java program to sort numbers using arrays. (10 marks)
2. (A) What are the control structures in java program ? (10 marks)
(B) Explain how JAVA achieves multiple inheritance using interfaces ? Explain with example. (10 marks)
3. (A) Explain How can we assign priority to a thread ? Does the priority value always lie between 1 and 10 ? Explain. (5 marks)
(B) What do you mean by 'synchronization' ? Why do we need it ? (5 marks)
(C) Write a note on exception handling in java (10 marks)
4. (A) Discuss event handling mechanism in Java. (10 marks)
(B) Describe the terms ActionEvent and ActionListener with example. (10 marks)
5. (A) Explain JDBC architecture. (10 marks)
(B) Explain and demonstrate JDBC concepts for searching Student table using roll no. (10 marks)
6. (A) Discuss thread synchronization and inter thread communication. (10 marks)
(B) Discuss any *four* built-in packages in java. (10 marks)
7. (A) Write java program to display even no between 0 to 20. (10 marks)
(B) What is meant by Command-Line Arguments ? Illustrate with an example. (10 marks)

[5 × 20 = 100 marks]

**FIRST SEMESTER M.C.A. DEGREE (REGULAR/SUPPLEMENTARY)
EXAMINATION, NOVEMBER 2021**

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) What are the different factors to be considered before designing an algorithm ?
(B) Discuss any two applications of string-processing algorithms.

(10 + 10 = 20 marks)
2. (A) Discuss the importance of algorithm analysis. Give the asymptotic notations and their role in specifying the time complexities of algorithms.
(B) With the help of a suitable example, explain the recursion-tree method for solving recurrences.

(10 + 10 = 20 marks)
3. (A) Explain the various steps involved in the divide-and-conquer approach and substantiate it with the recursive merge sort algorithm.
(B) Explain the general characteristics of problems for which the Dynamic Programming algorithm design strategy provides efficient algorithms. Give an example.

(10 + 10 = 20 marks)
4. (A) Explain the relationship among P, NP, NP-Complete, and NP-Hard problems.
(B) Give an application of Travelling salesman problem. Why the Travelling salesman problem is NP-complete ?

(10 + 10 = 20 marks)
5. (A) Discuss the importance of Parallel Algorithms. Give a brief note on PRAM computational models.
(B) What are the different measures to analyse parallel algorithms ?

(10 + 10 = 20 marks)

Turn over

6. (A) Define the sum of subsets problem. Give the backtracking approach to solve this problem.
- (B) Explain the type of problems for which the Greedy strategy provides efficient algorithms. Substantiate with an example.

(10 + 10 = 20 marks)

7. (A) Compare and contrast the conventional matrix multiplication method and Strassen's matrix multiplication.
- (B) Solve the following recurrence relations using the Master Theorem.

(a) $T(n) = 4T(n/2) + cn$; and (b) $T(n) = 16T(n/4) + n!$

(10 + 10 = 20 marks)