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Total Number of Pages : 02

Course: MCA
Sub_Code: MCBS1001

1st Semester REGULAR Examination: 2024-25
SUBJECT: Discrete Mathematics
BRANCH(S): MCA (2 Years)
Time : 3 Hours
Max Marks: 100
Q.Code: R418

Answer Question No.1 (Part-I) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** **(2 x 10)**

a) Explain the terms "antecedent" and "Consequent" with suitable counter examples.
b) Find the power set of $\{\phi, \{\phi\}\}$.
c) Define bijective function. Give an example of it.
d) Let $f: \mathbb{R} \to \mathbb{R}$ be defined by $f(x) = x + \lfloor x \rfloor$. Find the domain and range of f.
e) Explain the difference between linear search and binary search with example.
f) Define partial order set with an example.
g) How many distinct non-negative integer valued solutions of $x_1 + x_2 = 3$ are possible?
h) Find the coefficient of x^{16} in the expansion of $\left(2x^2 - \frac{x}{2}\right)^{12}$.
i) Prove or disprove that every strongly connected digraph is Hamiltonian.
j) Define Hamiltonian circuits with an example.

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 x 8)**

a) State Demorgan's theorem. Using Venn diagrams prove it.
b) Translate the statement "If either labor or management is stubborn, then the strike will be settled iff the government obtains an injuction, but troops are not sent into the mills." in symbolic form. Also construct its truth table.
c) Let A and B be any two sets. Prove that $AUB = B$ if and only if $A \subseteq B$.
d) Let $f: \mathbb{R} \to \mathbb{R}$ be defined by $f(x) = 2^{x-1} + 3$. Determine whether f is one-to-one and /or onto function.
e) Show that composition of bijective function is bijective.
f) Compute the double sum $\sum_{i=1}^{3}\sum_{j=1}^{2}(i-j)$ and $\sum_{i=0}^{4}\sum_{j=1}^{3} i^2 j^3$.
g) Prove that $\binom{n}{0} + \binom{n}{1} + \binom{n}{2} + \cdots + \binom{n}{n} = 2^n$, for all natural numbers n.
h) Let R be the relation on the set of real numbers such that aRb iff $a - b$ is an integer. Is R an equivalence relation? Justify your answer.

i) Define n-array relation. Discuss any four properties of n-array relation.
j) Explain graph isomorphism with a suitable counter example.
k) If G is disconnected planar Graph with k-component then prove that $n - e + f = k + 1$.
l) Prove that every planner graph is 6-vertex colorable.

Part-III
Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 **a)** Write down the converse and contrapositive of the following implications: **(8x2)**
(i) If $\frac{a}{b}$ and $\frac{b}{c}$ are integrs, then $\frac{a}{c}$ is an integer.
(ii) If $x^2 = x + 1$, then $x = 1 + \sqrt{5}$ or $x = 1 - \sqrt{5}$.

b) Show that $1 + 2 + 2^2 + \cdots + 2^n = 2^{n+1} - 1$, for all nonnegative integers n.

Q4 **a)** Write short notes on (i) Bubble sort (ii) Insertion sort **(8x2)**

b) Discuss on different types of growth of functions.

Q5 **a)** Define Pigeonhole principle. If there are 44 chairs positioned around five tables in a room, then show that some table must have at least $\left\lceil \frac{44}{5} \right\rceil$ chairs around it. **(8x2)**

b) Show that the number of ways of arranging n distinct objects around a circle is $(n-1)!$.

Q6 **a)** Show that a graph G is connected *iff* it has a spanning tree. **(8x2)**

b) Explain travelling Salesperson problem with a suitable example.

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Course: MCA
Sub_Code: MCPC1001

1st Semester Regular Examination: 2024-25
SUBJECT: Digital Logic Design
BRANCH(S): MCA (2 Yrs)
Time: 3 Hours
Max Marks: 100
Q.Code: R463

Answer Question No.1 (Part-I) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** **(2 x 10)**

a) What are universal gates? Explain how basic gates can be realized by using NAND gates?
b) Design and draw logic diagram of full adder.
c) What is Read only Memory? How PROM, EPROM, and EEPROM differ from each other?
d) What is JK Flipflop? Explain the operation of JK Flipflop.
e) Using KMAP simplify the below expression F (A, B, C, D) = $\sum$ m (0, 2, 3, 6, 7) + $\sum$ d (8, 10, 11, 15)
f) What is cache memory? Why is it called high speed memory?
g) Design a Full adder using half adders and logic gate.
h) Perform the subtraction $(15)_{10} - (60)_{10}$ using 2's complement method.
i) Draw a T-flip flop and write its excitation table
j) What is the decimal equivalent of the hexadecimal number "BAED"?

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 x 8)**

a) What is race around condition? Construct master slave flipflop using SR flipflop.
b) Design a 1-bit Full adder using only 3 to 8 size decoder and basic gates.
c) Design a circuit for the function Y = AB (C + D) using only 8:1 multiplexer.
d) Explain how a JK flipflop can be converted into a D flipflop.
e) Design a MOD-5 asynchronous counter using JK-flipflops.
f) Design a MOD-4 synchronous counter using D flipflops.
g) Design a half adder circuit using programmable logic array.
h) Write VHDL or Verilog code for designing a 1-bit Half adder.
i) Write VHDL or Verilog code for designing 8:1 multiplexer.

j) Explain the operation of bidirectional shift register.

k) Draw and describe the architecture of Field Programmable Gate Array.

l) Design a Gray to Excess-3 code converter using NAND gates only.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 Design a combinational circuit that gives an output 'two' more than the input numbers when the inputs are (1, 7, 11, 13) and 'four' less than the input numbers when inputs are (6, 12, 17, 19). **(16)**

Q4 **(16)**

Present State	Next State		Output	
	$x = 0$	$x = 1$	$x = 0$	$x = 1$
a	a	b	0	0
b	c	d	0	0
c	a	d	0	0
d	e	d	0	1
e	a	d	0	1

Derive the state diagram for the above state table after the binary assignment of each state. Design the corresponding sequential circuit.

Q5 Design the Boolean function Y = AB + CD using only 4:1 multiplexers. **(16)**

Q6 What is ring counter? Explain it with shift register. **(16)**

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Total Number of Pages: 02

Course: MCA
Sub_Code: MCPC1002

1st Semester Regular Examination: 2024-25
SUBJECT: Computer Networks
BRANCH(S): MCA (2Yrs)
Time: 3 Hours
Max Marks: 100
Q.Code: R507

Answer Question No.1 (Part-I) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** **(2 x 10)**

a) Define data communication and its components.
b) Differentiate between analog and digital signals.
c) What are the functionality of FTP in networking?
d) Name three standard client-server applications and their protocols.
e) Explain the role of CRC codes in error detection.
f) Discuss the significance of HTTP.
g) What are the different types of multiplexing?
h) Describe the optimality principle in routing algorithms.
i) Differentiate between IPv4 and IPv6 addressing.
j) Explain the packet switching in networking.

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 x 8)**

a) Compare the functionalities of UDP and TCP.
b) Illustrate the role of ICMP in network communication.
c) Define "connection-oriented" and "connectionless" networks with example.
d) Explain sliding window protocols with examples.
e) Describe the working of HDLC protocol.
f) Explain TCP congestion control mechanisms.
g) Describe the role of switches and routers in a network.
h) Explain store-and-forward packet switching.
i) Define and discuss the importance of multicast in networking.
j) Explain the Shortest Path routing algorithm with an example.
k) Discuss the role of logical addressing in internetworking.
l) Describe CIDR and its importance in IP addressing.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3	Explain the process of logical addressing and address mapping in networks, including protocols like ARP, RARP, and DHCP.	**(16)**
Q4	Discuss the design issues, protocols, and error correction methods in the Data Link Layer.	**(16)**
Q5	Explain the TCP/IP model, detailing each layer's responsibilities and comparing its functionality to the OSI model.	**(16)**
Q6	Describe congestion control techniques in the transport layer and discuss how TCP handles congestion in networks.	**(16)**

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Total Number of Pages: 02

Course: MCA
Sub_Code: MCPC1003

1st Semester Regular Examination: 2024-25
SUBJECT: Programming for Problem Solving
BRANCH(S): MCA (2 Yrs)
Time: 3 Hours
Max Marks: 100
Q.Code: R538

Answer Question No.1 (Part-I) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** **(2 x 10)**

a) What is the ternary operator? Write its syntax and the actual code that it means.

b) Define data type. Explain primitive data types supported by C language.

c) Given base address 4000, what is the address of element A[5] in an integer array A[ ]? Assume that memory is byte addressable and the size of integer is 4 byte.

d) Write any three library functions to read from a file. If fopen() functions is not able to open a file, what does it returns?

e) What value strcmp() function returns when two strings are: I) same, Ii) different?

f) Find out the error in the following code and rectify it.

```
#include <stdio.h>
int main()
{
 int var;  /*Suppose address of var is 2000 */
 void *ptr = &var;
 *ptr = 5;
 printf("var=%d and *ptr=%d",var,*ptr);
 return 0;
}
```

g) Explain the meaning of the following declaration.
int *fun (char *, int *);

h) What is the difference between call by value and call by reference?

i) What is the significance of dynamic memory allocation? Differentiate the syntactical difference between malloc() and calloc().

j) What is the use of preprocessor directives in C?

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 x 8)**

a) Define constant. List the different types of C constants.

b) Distinguish between entry-controlled loop and exit-controlled loop. Write a program to find the sum of all prime numbers from 1 to n (taking n as user input).

c) Discuss the various operators used in C programming with suitable examples.

d) An electricity board charges the following rates for the use of electricity: for the first 150 units Rs. 1 per unit; for the next 100 units Rs. 2 per unit; beyond 250 units Rs. 3 per unit. All users are charged a minimum of Rs. 75 as meter charge. If the total amount is more than Rs. 300, then an additional surcharge of 12.5% of the total amount is charged. Write a program to read the number of units consumed and print out the charges. Use single-line comments to denote the charge ranges.

e) Write a C program to multiply two matrices of dimension n x n and store the result in another matrix.

f) Write a program in C to reverse a string by using pointer.

g) Write a program in C to read a text file named input.txt consisting of meaningful sentences (at least 1000 words). Count total number of words and display the most frequently occurred word along with its count.

h) Write a currency program that tells you how many 100, 50, 20, 10, 5, 2, and 1 rupee notes will be needed for a given amount of money. For example:
If the total amount is 545 rupees then five 100 rupee notes, two 20 rupee notes and one 5-rupee note will be needed.

i) Explain with suitable examples the scope, visibility, and lifetime of auto, external, static and register variables.

j) What does argc and argv indicate in command-line arguments? Write a C Program to counts total number of words in the sentence using command line argument.

k) What is a structure? Explain the components of a structure. Distinguish between structure and union with suitable examples.

l) Illustrate syntax error, logical error, and runtime error with suitable examples.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 Write the syntax of different branching statements and explain their working with examples. Write a C program to print the reverse of a given integer. **(16)**

Q4 What is an array? Discuss different ways to declare and define one-dimensional and two-dimensional arrays with suitable examples.
Write a C program to enter a matrix of order m x n then print the difference between sum of the elements of main diagonal and sum of the elements of first row of the matrix. **(16)**

Q5 Define function in C programming? Classify the user defined functions in C based on parameter passing and return type with suitable examples. **(16)**
Like Fibonacci, there exists a Tribonacci series where the n-th term is defined as:
$T(n) = T(n-1) + T(n-2) + T(n-3)$, where $T(0) = 0$, $T(1) = T(2) = 1$
Define a recursive function that takes 'n' as user input and prints the n-th Tribonacci term.

Q6 What is meant by an abstract data type (ADT)? Differentiate between linear and nonlinear data structure. Explain Insertion and Deletion Operation on a Singly Linked List with suitable examples. **(16)**

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Course: MCA
Sub_Code: MCPC1004

1st Semester Regular Examination: 2024-25
SUBJECT: Database Management Systems
BRANCH(S): MCA (2 Yrs)
Time: 3 Hours
Max Marks: 100
Q.Code: R581

Answer Question No.1 (Part-I) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** (2 x 10)

a) In Relational model what do you mean by cardinality?
b) How can you map a conceptual model to a relational model?
c) What is the use of DML in DBMS?
d) List two reasons why we may choose to define a view.
e) A primary key if combined with a foreign key creates what?
f) Explain the following terms associated with relational database design: Primary Key, Secondary key, Foreign Key.
g) What is ACID property?
h) Find the number of candidate keys from the following FDs.
R (A, B, C, D) FD = {A → B, B → C, A → C}
R (X, Y, Z, W, P) FD = {Y → Z, Z → Y, Z → W, Y → P}
i) What is Phantom Phenomenon?
j) Define query processing.

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** (6 x 8)

a) Define functional dependency (FD)? Explain using a suitable example.
b) What do you understand by a data model? Explain the difference between conceptual data model and the internal model.
c) Explain the entity integrity and referential integrity constraints. How they are use full in database Design?
d) Explain with the help of examples, the concept of insertion anomalies and deletion anomalies
e) What is update anomalies? Explain with example.
f) Explain QBE with example
g) What is the goal of query optimization? Why is optimization important?

h) Given R with FD set F = {A→B, BC→D, D→BC, DE→Ø}. Find the number of redundant FDs in F.

i) What do you mean by semi join? Explain with example.

j) What is tuple calculus? Define tuple variables and well-formed formulas.

k) What does the term redundancy mean? Discuss the implications of redundancy in a relational database.

l) Given R(ABCDEFGH) with FDs F = {A→C, B→D, E→ F, G→H, C→G}. How many number of candidate keys are there? Which normal form R is in?

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 a) Does a relation in a 3rd Normal form satisfy the properties of Lossless decomposition and dependency preservation? Explain with an example. **(8x2)**

b) Eliminate redundant FDs from
(i) F = {X → Y, Y→ X, Y → Z, Z → Y, X → Z, Z → X}
(ii) F = {X → YZ, ZW → P, P → Z, W → XPQ, XYQ, YW, WQ → YZ}

Q4 a) What is normalization? Explain the first and second normal forms using appropriate example. **(8x2)**

b) Define (i) primary key and (ii) foreign key. Suppose relation R (A, B, C, D, E) has functional dependencies:
AB → C
D → A
AE → B
CD → E
BE → D
Find all the candidate keys of R.

Q5 a) What is serializability? Explain conflict serializability and view serializability. **(8x2)**

b) Test if the following schedule is conflict serializable or not.
R1 (A), R2 (D), W1 (B), R2 (B), W3 (B), R4 (B), W2 (C), R5 (C), W4 (E), R5 (E), W5 (B).

Q6 a) A database is being constructed to keep track of the teams and games of a sports league. A term has a number of players, not all of whom participate in each game. It is desired to keep track of the players participating in each game for each team, the positions they played in that game, and the result of the game. Try to design an ER schema diagram for this application, stating any assumptions you make, Choose your favourite sport (soccer, football, baseball.....) **(8x2)**

b) What are the basic operations for a relational language? How are basic operations represented in relational algebra, TRC, DRC, and SQL?

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Course: MCA
Sub_Code: MCHS1001

1st Semester Regular Examination: 2024-25
SUBJECT: Communicative English
BRANCH(S): MCA (2 Yrs)
Time: 3 Hours
Max Marks: 100
Q.Code: R442

Answer Question No.1 (Part-I) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right-hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** **(2 x 10)**

a) What is "Noise" in communication?
b) Why is "Feedback" important for the process of communication?
c) Why is maintaining eye contact important for effective listening?
d) What is intonation in speaking?
e) What is the role of body language in public speaking?
f) What is the main objective of a group discussion?
g) List 03 examples of non-verbal communication.
h) Explain the role of the sender in the communication process.
i) What is the purpose of a memo in a business context?
j) How can visual aids enhance a presentation?

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 x 8)**

a) Differentiate between "Listening and Hearing".
b) What do you understand by the "Chronemic Rules" of a language? Explain with examples.
c) Explain with examples the difference between "Cohesion and Coherence".
d) What is Ethnocentrism? How can you avoid it?
e) State the various features of a Chronological Resume.
f) Discuss the key steps in preparing for a job interview. Why is research about the company important before an interview?
g) Explain the challenges of cross-cultural communication in a global workplace. How can these challenges be addressed effectively?
h) Explain how to effectively answer the common interview question: "Tell me about yourself". Provide an example response.

i) Fill in the blanks with appropriate form of the tense given in brackets:

I. She _____ (work) on the project for three hours when her team leader arrived. (Use the correct past perfect continuous tense.)

II. The report _____ (analyze) thoroughly by the time the meeting _____ (begin). *(Use the correct tense for both blanks.)*

III. The software update _____ (release) last week but the users reported multiple bugs. (Use the correct past simple tense.)

IV. I _____ (develop) this app for six months, and it is almost ready for deployment. (Use the correct present perfect continuous tense.)

V. If the team _____ (complete) the task earlier, we could have launched the product last month. (Use the correct past perfect tense.)

VI. While the developer _____ (fix) the bug, the QA team _____ (conduct) tests on other modules. *(Use the correct tense for both blanks.)*

j) Define plagiarism in the context of academic and business writing. Suggest ways of avoiding plagiarism.

k) What is the key difference between an inquiry letter and a complaint letter?

l) What is the importance of practicing your presentation before delivery?

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 Explain the importance of visual aids in oral presentations. What are some best practices for designing and using visual aids effectively? **(16)**

Q4 Your company is introducing a new workplace policy on remote work, effective from next month. As the HR manager, you need to draft a memo to inform all employees about the policy, including key details, such as eligibility, expectations, and the implementation timeline. **(16)**

Q5 You are an MCA student planning to attend an international conference on Artificial Intelligence. Write a formal inquiry letter to the event organizer requesting details about the event, including registration fees, keynote speakers, submission deadlines for research papers, and accommodation arrangements. **(16)**

Q6 Your team has missed an important deadline due to unexpected technical challenges. As the team leader, you need to email the senior management explaining the reasons for the delay, the actions taken to resolve the issue, and the revised timeline for project completion. **(16)**