

University of Information Technology & Sciences (UITS)**Faculty of Science and Engineering****Department of Computer Science and Engineering****Program: B.Sc. in CSE****Mid Term Examination, Autumn 2024****Course Title: Discrete Mathematics****Course Code: CSE 0541123****Marks: 20****Time: 1 (One) Hour**

[Answer all Five(5) question sets. And, from each question set, answer only one question X where $X = \text{MOD}(\text{ID}, \text{max_option})$. So, if $X=0$ then "a", if $X=1$ then "b", if $X=2$ then "c" and so on. ID is the last three digits of your student ID]

Correction:**Only applicable for no. 1**

1. Let p and q be the propositions p: "I was elected Mayor." q: "I reduced taxes". Express each of these propositions as an English sentence. [04]
 - a) $\neg p$
 - b) $p \vee q$
 - c) $p \rightarrow q$
 - d) $p \wedge q$
 - e) $p \leftrightarrow q$
 - f) $\neg p \rightarrow \neg q$
 - g) $\neg p \wedge \neg q$
 - h) $\neg p \vee (p \wedge q)$
2. "You can get internet access from the campus if you are not a freshman or you are a computer science major". [04]

Express your answer in terms of -

i: "You can get internet access from the campus,"

f: "you are a freshman," and

c: "you are a computer science major."
3. Using truth table prove that [04]
 - a) $\neg(p \vee q) \equiv \neg p \wedge \neg q$
 - b) $\neg(p \wedge q) \equiv \neg p \vee \neg q$
4. Express the following into predicate calculus, where S(x) - "x is a student of the class", M(x)- "x has visited Mexico", C(x)- "x has visited Canada". [04]
 - a) "For every x in this class, x has the property that x has visited Mexico or x has visited Canada."
 - b) Negate the statement of question "a".
5. Express the following into logical expressions. [04]
 - a) "If a person is male and is a parent, then this person is someone's father", where M(x)- "x is a male", P(x)- "x is a parent" and M(x,y)- "x is mother of y".
 - b) Translate the statement $\forall x(C(x) \vee \exists y(C(y) \wedge F(x, y)))$, where C(x)- "x has a computer", F(x,y) is : "x and y are friends".

University of Information Technology & Sciences (UITS)
Faculty of Science and Engineering
Department of Computer Science and Engineering
Program: B.Sc. in CSE
Term Final Examination, Autumn-2024
Course Title: Discrete Mathematics
Course Code: CSE 0541123

Marks: 50

Time: 3 Hours

(Answer all questions)

1. a) Translate into English the statement [04]
 $\forall x \forall y ((x > 0) \wedge (y < 0) \rightarrow (xy < 0))$
where the domain for both variables consists of all real numbers.
- b) Construct a truth table to show that $\neg(p \vee q) = \neg p \wedge \neg q$. [03]
- c) Let $q =$ "I study Discrete Mathematics very well". $p =$ "I shall have strong foundation for algorithms". Then write down $q \rightarrow p$ in language, and its converse, contrapositive and inverse. [03]
2. a) Let $A = \{1, 2, 3, 4, 5, 6, 7, 8\}$ and $B = \{1, 2, 3, 7, 9\}$. Find [04]
i) $A \cup B$. ii) $A \cap B$. iii) $A - B$ iv) $B - A$.
- b) Give a direct proof of the theorem "If m is an odd integer, then m^2 is odd." [03]
- c) Prove that at least four of any 37 days must fall on the same month of the year. [03]
3. a) In a class nobody failed in all subjects. 30+i students passed in DM, 35 passed in CP and 38 students passed in Phy. 20 students passed in both DM and CP, 27 students passed in both CP and Phy, 24 students passed in both Phy and DM. Calculate the minimum and maximum number of students in the class. Where $i = \text{MOD}(\text{Last 3 digits of your ID}, 3)$ [04]
- b) Distinguish the following functions- one-to-one, on to and one to one and onto using appropriate figures. [03]
- c) Compute $3^{64+i} \bmod 7$ using modular exponentiation. [03]
Where $i = \text{MOD}(\text{Last 3 digits of your ID}, 3)$.
4. a) A man has 3 sons, 5 daughters and 7 grandchildren. If he distributes his money equally among only sons then Tk 2 left, among daughters Tk 3 and among grandchildren then Tk 1 left. Determine the minimum amount of money he had. [04]
- b) Prove that there are infinitely many primes. [03]

c) Using shift cipher with $k=5$, that is $f(p)=(p+5) \bmod 26$ produce the secret message for "MEET YOU IN THE PARK". [03]

5. a) Write down the procedure **linear search** that will search element x in a set of N number of integers. As output, it will give the location index where x is found in the list or -1 otherwise. [04]

b) If m is a composite integer, then m has a prime divisor less than or equal to \sqrt{m} . [03]

c) Find an integer that is divisible by 13 and that can be written in decimal number systems with digits 0 and 1 only and no other digits. [03]

~~5.10~~

Discrete Mathematics - DM CT 1

20 + i students passed in DM & CP, 25 - i students passed in CP & M and 28 students passed in DM & M. What could be maximum and minimum # of students in the class? What could be mini & maxi # of students who passed in all subjects?

$$L = \text{mod}(\text{stid}, 6)$$

Assume no student failed in all subjects.

Discrete Mathematics - DM CT 2

CSE-0541123 CT#2 Date : 26/11/2024

In a class $40+i$, $45-i$ and 33 students passed respectively in Discrete Mathematics(DM), Computer Programming(CP) and Modern Physics(MP). Also 21, 28 and 15 students passed in both DM and CP, CP and MP, and MP and DM respectively. If none failed in all subjects what is the minimum and maximum number of students in the class, where $i \equiv \text{mod}(\text{StID}, 3)$? Use Venn diagrams.

Discrete Mathematics - DM CT 1

DM CT question:

$(20+i)$ students passed in DM & CP,

$(25-i)$ students passed in CP & M and
28 students passed in DM & M. What

could be maximum and minimum # (number)
of students in the class?

What could be mini & maxi # of
students who passed in all subjects?

Suppose, $i \equiv \text{mod}(\text{stid}, 6)$.

↓
last 3 digits

Assume that no student failed in all subjects