II B.Tech I Semester Regular Examinations, February/March 2023

DISCRETE MATHEMATICS
(Common to CSE, AIML & DS)

: 3 hours   Max Marks: 70

ructions:

. Question paper comprises of **Part-A** and **Part-B**
. **Part-A** (for 20 marks) must be answered at one place in the answer book.
. **Part-B** (for 50 marks) consists of **five questions with internal choice,** answer all questions.

PART – A
(Answer ALL questions. All questions carry equal marks)

10 * 2 = 20 Marks

Write the inverse and contrapositive of the following implication: If triangle ABC is a right angle triangle, then $AB^2 + BC^2 = AC^2$	[2]	CO1	BL1
Find the inference form of the following statements All fathers are males Some students are fathers Hence, some students are males	[2]	CO1	BL2
Use the properties of sets to prove $A \cup (B - A) = A \cup B$ for all sets A and B in the universal set U.	[2]	CO2	BL2
Write the properties of Binary relation.	[2]	CO2	BL2
Write 3-combinations of $\{3.a,\ 2.b,\ 5.c\}$	[2]	CO3	BL3
Find the number of arrangements of the letters of the word "ENGINEERING".	[2]	CO3	BL4
Define recurrence relation.	[2]	CO4	BL1
Write a short note on substitution method to solve recurrence relation.	[2]	CO4	BL1
Define Spanning tree.	[2]	CO5	BL1
What is the chromatic number of a Cycle?	[2]	CO5	BL4

PART – B
(Answer ALL questions. All questions carry equal marks)

5 * 10 = 50 Marks

(a) Construct the truth table for the following: [10] CO1 BL3

$$\{(p \to r) \wedge (q \to r)\} \to ((p \vee q) \to r)$$. What can you conclude from the above implication?

(b) Verify whether the following argument is valid? If Clinton does not live in   BL4
France then he does not speak French. Clinton does not drive a Datsun.
If Clinton lives in France, then he rides a bicycle. Either Clinton speaks French
or he drives a Datsun. Hence, Clinton rides a bicycle.

OR

3. (a) Prove or disprove the validity of the following argument.
Students of average intelligence can do arithmetic. A student without average intelligence cannot pass in the examination. My student cannot do arithmetic. Therefore my student cannot pass in the examination

(b) Verify whether the following argument is valid or not?

$\sim t \rightarrow \sim r$

$\sim s$

$t \rightarrow w$

$r \vee s$

Then: w

4. (a) Let R is reflexive relation on a set A. Show that R is an equivalence relation if (a, b) and (a, c) are in R $\Rightarrow (b, c) \in$ R.

(b) If 'n' is a positive integer. Let D_n denote the set of positive divisors of 'n' then draw the Hasse diagram of the following posets.
(i) $[D_{12}, /]$ (ii) $[I_6, /]$

OR

5. (a) Let $[A; \leq]$ is a lattice, then prove $\forall$ a,b,c ε A (i) $a \vee (a \wedge b) = a$
(ii) $a \wedge (a \vee b) = a$

(b) Prove that, In a group of 61 people at least 6 people were born in the same month.

6. (a) In a class of 100 students 47 can write a program in C++, 35 in Java and 23 can program in both the languages. How many can program in neither of these languages?

(b) How many different plates are possible that involve 1, 2, or 3 letters followed by 1, 2, 3, and 4 digits?

OR

7. Find the number of integers that lie between 1 & 1000 that are not divisible by 2, 3 and 5.

8. (a) Find the coefficient of X^{14} in

$(X + X^2 + X^3 + X^4 + X^5)(X^2 + X^3 + X^4 + ...)^5$

(b) Solve the recurrence relation $a_n - 9a_{n-1} + 20a_{n-2} = 0$ for n ≥ 2 where
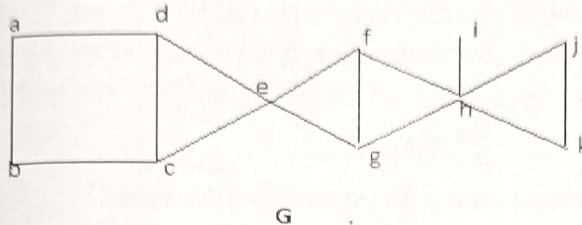$a_0 = -3$ $a_1 = -10$

OR

Find the (i) homogeneous solution, (ii) particular solution, and (iii) general solution   [10]   CO4   BL2
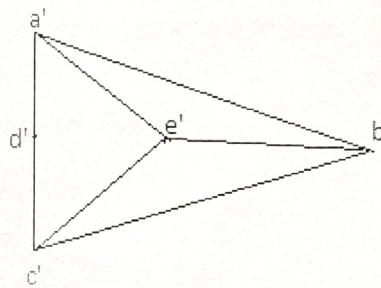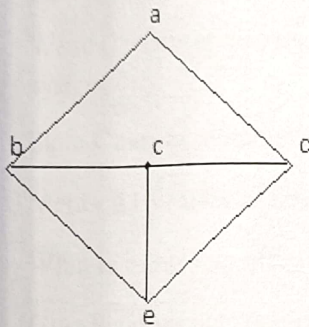to the following inhomogeneous recurrence relation.

$a_n - 4a_{n-1} + 4a_{n-2} = 2^n$, $n \geq 2$, with $a_0 = -5$, $a_1 = 3$.

(a) Find a spanning tree with vertex ordering **abcdefghijk** using Breadth First   [10]   CO5   BL4
Search algorithm for the following non -directed graph G.

G

(b) Test whether the given graphs are isomorphic or not.

G   G'

OR

(a) If G is a connected planar graph then prove that $|V| - |E| + |R| = 2$.   [10]   CO5   BL4

(b) Calculate the minimum weight of the spanning tree for the following graph
using Kruskal's Algorithm.

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