

II B.Tech I Semester (R18) Regular Examinations November 2019
DISCRETE MATHEMATICS

Time : 3 hours

Max. Marks: 70

PART- A

(Compulsory Question 10*2=20 Marks)

- 1 a Give the symbolical representation and converse of the implication of the statement “if it is raining then I get wet”.
- b Define Predicate and explain with the help of example.
- c Find the number of different symmetric relations that can be defined on the set $A = \{1, 2, 3, 4\}$
- d Represent the relation $R: A \rightarrow A$, $A = \{1, 2, 3, 4, 5\}$, $R = \{(1, 4), (2, 3), (4, 2), (3, 3), (1, 1), (5, 1)\}$ using graph and matrix methods.
- e If \circ is an operation on Z defined by $x \circ y = x + y + 1$, prove that (z, \circ) is an abelian group?
- f Define the operation “under multiplication modulo 7”
- g Show the complete graph K_5 is not a planar graph.
- h Define the meaning of Graph coloring and chromatic number.
- i How many different ways a 5 digit number (n) can be prepared using digits $\{0, 1, 2, 5, 6\}$, where $n > 5000$.
- j Define the Partition of integers with the help of example.

PART B

(Answer all the Questions Each carry 10 Marks)

- 2 a Show that $\neg P \wedge (\neg Q \wedge R) \vee (Q \wedge R) \vee (P \wedge R) \Leftrightarrow R$
- b write the equivalence formulas of predicate statements and find the negation of the statement $\left[\forall x \exists y \left[(p(x, y) \wedge q(x, y)) \rightarrow r(x, y) \right] \right]$

OR

- 3 a Prove the equivalence $p \vee q \vee (\neg p \wedge \neg q \wedge r) \Leftrightarrow p \vee q \vee r$
- b Show that $R \vee S$ follows logically from the premises $C \vee D$, $(C \vee D) \rightarrow \neg H$, $\neg H \rightarrow (A \wedge \neg B)$ and $(A \wedge \neg B) \rightarrow (R \vee S)$.

- 4 a Let $A = \{1, 2, 3, 4\}$. Give an example of a relation on A that is:
 - i) Reflexive & Symmetric but not Transitive
 - ii) Reflexive & Transitive, but not Symmetric
 - iii) Symmetric & Transitive but not Reflexive
 - iv) Equivalence relation
 - v) Only antisymmetric
- b. Verify the following relations are functions or not If $f: R \rightarrow R$

i) $f(x) = \frac{1}{x}$ $f(x) = 1/x$

ii) $f(x) = |x|$

iii) $f(x) = \text{sqrt}(x)$

iv) $f(x) = \pm \text{sqrt}(x^2 + 1)$

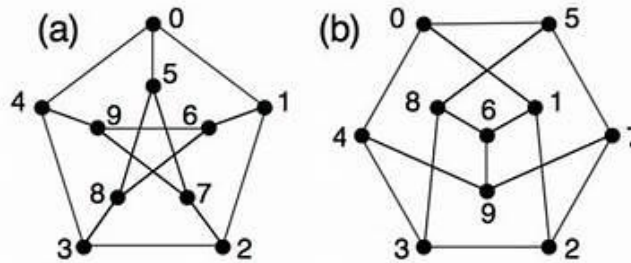
OR

- 5 a $R: A \rightarrow A$, $A = \{1, 2, 3, 4\}$, $R = \{(1, 4), (2, 3), (4, 2), (3, 3), (1, 1)\}$ find the transitive closure of the relation?
- b Define the partial order relation and compatibility relation? Give an example which is both partial and compatibility relation over a set $A = \{1, 2, 3, 4\}$

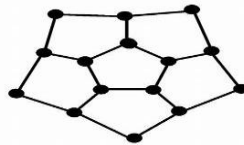
- 6 a Show that the algebraic system $(A, *)$ is a group, where $A = \{-1, +1, -i, +i\}$ and $*$ is a multiplication operation.
 b Define the lattice and its properties.

OR

- 7 a Let G be a group of positive real numbers under multiplication and G' be a group of all real numbers under addition. The mapping $f : G \rightarrow G'$ given by $f(x) = \log_{10} x$. Show that f is a Homomorphism.
 b Let G be the set of real numbers not equal to -1 and $*$ be defined by $a * b = a + b + a \times b$. Prove that $(G, *)$ is a group.
- 8 a Find, whether the below graphs are similar or not using procedure of graph isomorphism?



- b Define Euler and Hamiltonian graphs, Find the following graph is Eulerian or Hamiltonian or both?



OR

- 9 a Define the following types of trees
 i) Height balance tree
 ii) Complete tree
 iii) Fully binary tree
 iv) Binary tree
 b Find the optimal prefix code for the alphabets a,e,i,o,u with the frequencies 12,5,9,8,2 respectively.
- 10 a A group of 8 is composed of 5 psychologists and 3 sociologists.
 a) In how many ways can a committee of 5 be formed?
 b) In how many ways can a committee of 5 be formed that has 3 psychologists and 2 sociologists?
 b Show that $nC_0 + nC_1 + nC_2 + \dots + nC_n = 2^n$

OR

- 11 a Find the generation function of the following sequence $0, 2, 6, 12, 20, 30, 42, \dots$
 b. Define the rook Polynomials & Arrangement with forbidden arrangements.