

R22

Code No: 184AU

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech II Year II Semester Examinations, December – 2024/January -2025

DISCRETE MATHEMATICS

(Common to CSE, IT, CE(SE), CSE(CS), CSE(AI&ML), CSE(DS), AI&DS, AI&ML, CSD)

Time: 3 Hours

Max. Marks: 60

Note: This question paper contains two parts A and B.

i) **Part- A** for 10 marks, ii) **Part - B** for 50 marks.

- Part-A is a compulsory question which consists of ten sub-questions from all units carrying equal marks.
- Part-B consists of **ten questions** (numbered from 2 to 11) **carrying 10 marks each**. From each unit, there are two questions and the student should answer one of them. Hence, the student should answer five questions from Part-B.

PART- A

(10 Marks)

- 1.a) Define the conjunction and give its truth table. [1]
- b) Explain the quantifiers in predicate calculus. [1]
- c) Define the intersection of any two sets. [1]
- d) Define an onto function. [1]
- e) Give an example for a semigroup. [1]
- f) Define a lattice. [1]
- g) Find $5P_3$ and $5C_3$. [1]
- h) State the binomial theorem. [1]
- i) Define a subgraph. [1]
- j) Define a Hamiltonian graph. [1]

PART - B

(50 Marks)

- 2.a) Construct the truth table of the formula $\neg(P \vee (Q \wedge R)) \Leftrightarrow ((P \vee Q) \wedge (P \vee R))$.
- b) Define Quantifiers and types of Quantifiers with examples. [5+5]

OR

- 3.a) Obtain the principal disjunctive normal form of $(P \wedge Q) \vee (\neg P \wedge R) \vee (Q \wedge R)$.
- b) Show that $(x)(P(x) \rightarrow Q(x)) \wedge (x)(Q(x) \rightarrow R(x)) \Rightarrow (x)(P(x) \rightarrow R(x))$. [5+5]

- 4.a) Define a subset, proper set and power set of a non-empty set and give an example in each case.

- b) Let R be a relation on the set of positive real numbers so that its graphical representation consists of points in the first quadrant of the cartesian plane. What can we expect if R is (i) reflexive (ii) symmetric and (iii) transitive? [5+5]

OR

QA QA QA QA QA QA QA QA QA

- 5.a) For all sets A, B, and C, $(A \cup B) \cap C = (A \cap C) \cup (B \cap C)$.
 b) Let $R = \{(a,b)(b,c),(c,d)(d,e)\}$. Find the transitive closure of R. [5+5]

6. Define the algebraic system and explain it with suitable examples in detail. [10]

OR

- 7.a) Define a clock algebra and give its composition table.
 b) Define a Boolean algebra and discuss its properties. [5+5]

8.a) In how many ways can the 26 letters of the English alphabet be permitted to form a 3 letter word. How many of the 3 letters contains vowel at the middle and the other two are distinct consonants.

b) Find the coefficient of $x^3y^2z^2$ in the expansion of $(x+y+z)^9$. [5+5]

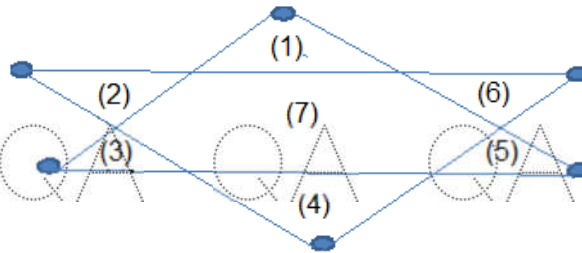
OR

9.a) Enumerate the number of nonnegative integral solutions to the inequality $x_1 + x_2 + x_3 + x_4 + x_5 \leq 19$.

b) The question paper of mathematics contains two questions divided into two groups of 5 questions each. In how many ways can an examinee answer six questions taking at least two questions from each group. [5+5]

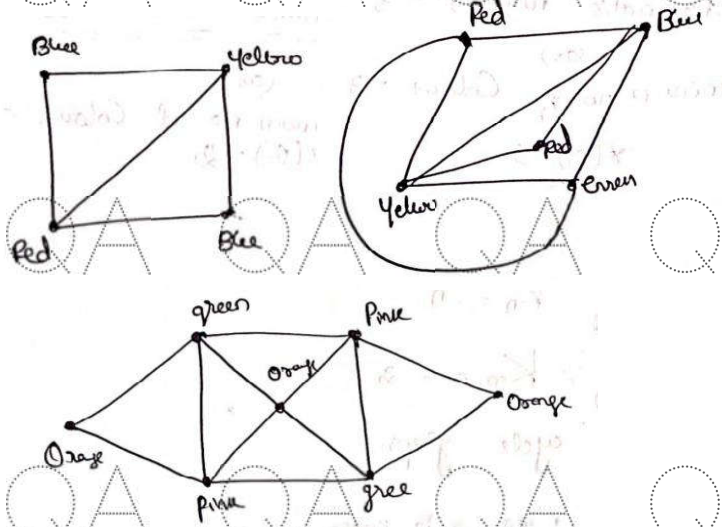
10.a) Define a graph and a digraph. How many vertices will the graph have if they contain 16 edges and all vertices are of degree 2?

b) Verify the Euler's formula for the following connected planar graph 1. [5+5]



Graph 1
OR

11. Define a chromatic number and hence find the chromatic number of the following graphs 2: [10]



Graph 2
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