



R22 Regulation

Subject code:4E4FA

# TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A+' Grade)

TKRCET  
Influencing Character • Informing Intelligence

## B.Tech IV Semester Supplementary Examinations, December 2025

### DISCRETE MATHEMATICS

(IT)

Maximum Marks: 60

Date:16.12.2025

Duration: 3 hours

- Note:
- 1.This question paper contains two parts A and B.
  2. Part A is compulsory which carries 10 marks. Answer all questions in Part A.
  3. Part B consists of 5 Units. Answer any one full question from each unit.
  4. Each question carries 10 marks and may have a, b, c, d as sub questions.

#### Part-A

All the following questions carry equal marks (10X1M=10 Marks)		Marks	CO	Bloom Tx
1.a)	Write down the converse and contrapositive of the conditional statement, "The home team wins whenever it is raining".	1M	CO1	K1
b)	Write the negation of the statement: $(\exists x)(\forall y)P(x, y)$	1M	CO1	K2
c)	In how many ways the letters of the word 'INDIA' can be arranged?	1M	CO2	K2
d)	Find the recurrence relation for $S(n) = 6(-5)^n, n \geq 0$ .	1M	CO2	K3
e)	How many vertices does a regular graph of degree 4 with 10 edges have.	1M	CO3	K3
f)	Define complete bipartite graph.	1M	CO3	K1
g)	Show that any cyclic group is abelian.	1M	CO4	K2
h)	If H and K are subgroups of G with $O(H) = 7, O(K) = 13$ , prove that $H \cap K = \{e\}$ .	1M	CO4	K3
i)	Prove that the relation $R = \{(a, b) : 1 + ab > 0\}$ on S is transitive or not, where S be the set of all real numbers.	1M	CO5	K2
j)	If $f(x) = x^2 + 6$ and $g(x) = 2x - 1$ , then find $(f \circ g)(2)$	1M	CO5	K3

#### Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	Bloom Tx
2	Without using truth table find PCNF of $(P \rightarrow (Q \wedge P)) \wedge (\sim P \rightarrow (\sim Q \wedge \sim R))$ .	10M	CO1	K3
OR				
3	Examine the validity of the following argument: All integers are rational numbers. Some integers are powers of 2. Therefore, some rational numbers are powers of 2.	10M	CO1	K3
4	Find the solution to the recurrence relation $a_n = 6a_{n-1} - 11a_{n-2} + 6a_{n-3}$ with $a_0 = 2, a_1 = 5$ & $a_2 = 15$ .	10M	CO2	K3
OR				

5	Find the number of integers between 1 and 250 that are not divisible by any of the integers 2, 3, 5 and 7.	10M	CO2	K3
6	Find the adjacency matrix of the following graph G. Find $A^2, A^3$ and $Y = A + A^2 + A^3 + A^4$ . What is your observation of entries in $A^2$ and $A^3$ .	10M	CO3	K4
	OR			
7	Explain Eulerian and Hamiltonian graphs with examples, also draw the graphs of the following: a) Eulerian but not Hamiltonian      b) Hamiltonian but not Eulerian	5M 5M	CO3	K4
8	Prove that a non-empty subset H of a group $(G, *)$ is a subgroup of G if and only if $a * b^{-1} \in H \forall a, b \in H$	10M	CO4	K4
	OR			
9	State and prove Lagrange's theorem.	10M	CO4	K4
10	Show that the relation R is an equivalence relation in the set $A = \{1, 2, 3, 4, 5\}$ given by the relation $R = \{(a, b) :  a - b  \text{ is even}\}$ .	10M	CO5	K3
	OR			
11	Prove that $(S, \leq)$ is a poset, where $S = \{1, 2, 4, 8, 24, 48\}$ and $x \leq y$ if $x/y$ (i.e) x divides y, draw its Hasse diagram.	10M	CO5	K3