



K. K. Wagh Institute of Engineering Education & Research, Nashik
(An Autonomous Institute From A.Y. 2022-23)

InSem Examination-IWinter 2023			
Exam Seat No.:			
Academic Year:2023-2024		Semester:III	
Name of Programme: Computer/AI&DS/CSD		Pattern:2022	
Name of Course:Discrete Mathematics		Course Code:COM222003	
Max. Marks:30		Duration:1 Hr	

Instructions: Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use. 1. This question paper contains 3 pages. 2. Answer to each new question is to be started on a new page. 3. Assume suitable data wherever required, but justify it. 4. Draw the neat labelled diagrams, wherever necessary. 5. The last columns indicates the Course Outcome	
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Question No. 1 Attempt following Question

- a) Translate following into Inverse and Contrapositive statement
- I. If triangle is not isosceles then it is not equilateral. (4) CO1
- II. If he is considerate of others then a man is gentleman

OR

- b) Translate following into Inverse and Contrapositive statement
- I. If I will go to movie then I will be in good mood (4) CO1
- II. If I am in good mood then I will study Discrete Mathematics

- c) Show $(p \rightarrow q) \leftrightarrow (\sim p \vee q)$ is a tautology by constructing truth table (4) CO1

OR

- d) Show $(p \vee q) \wedge (\sim p \wedge \sim q)$ is a contradiction by constructing truth table (4) CO1

- e) Solve using mathematical induction (4) CO1
- $$1^2 + 3^2 + 5^2 + \dots + (2n - 1)^2 = n(2n - 1)(2n + 1)/3$$

OR

f) Make use of given encryption function to encrypt the message “ WE ARE STUDENTS OF ENGINEERING” (4) CO1
 $f(p) = (p + 3) \bmod 26$

g) Find Conjunctive normal form of $p \leftrightarrow (\sim p \vee \sim q)$ using algebraic laws (3) CO1

OR

h) Find GCD of 9888 and 6060 using Euclidean algorithm (3) CO1

Question No. 2 Attempt following Question

a) Show relation
 $R = \{(x, y) \mid x \in A, y \in B, y \text{ is divisible by } x\}$ on sets (4) CO2
 $A = \{1, 2, 3, 4, 8\}$ and $B = \{1, 4, 6, 9\}$ in 4 different forms

OR

b) Show relation aRb iff $b = a^2$ on sets (4) CO2
 $A = \{1, 2, 3, 4\}$ $B = \{1, 4, 6, 8, 9\}$ in ordered pairs and matrix forms and find domain & range of R.

c) Show that relation
 $R = \{(x, y) \mid x, y \in A, x + y = 5\}$ on a set $A = \{1, 2, 3, 4, 5\}$ is not a equivalence relation. (4) CO2

OR

d) Show that the relation $R = \{(a, b) \mid a, b \in A \text{ and } a - b = \text{odd positive integer}\}$ on set $A = \{X \mid X \text{ is odd positive integers}\}$ is not a equivalence relation (4) CO2

e) Determine transitive closure of relation $R = \{(1, 2), (2, 1), (2, 3), (3, 4)\}$, on set $A = \{1, 2, 3, 4\}$ by Warshall's algorithm (4) CO2

OR

f) Determine which of these relations on a set
 $\{0, 1, 2, 3\}$ are partial orderings? (4) CO2
 $R_1 = \{(0, 0), (1, 1), (1, 2), (1, 3), (2, 0), (2, 2), (2, 3), (3, 0), (3, 3)\}$
 $R_2 = \{(0, 0), (0, 1), (0, 2), (0, 3), (1, 0), (1, 1), (1, 2), (1, 3), (2, 0), (2, 2), (3, 3)\}$

g)

Determine

i. $g \circ f$ ii. $f \circ g$ iii. $f \circ h \circ g$

(3) CO2

for the functions $f(x) = x+2$, $g(x) = x-2$, $h(x) = 3x$

OR

h)

Interpret partial ordering relation $\{(a, b) \mid a \leq b\}$ on set

(3) CO2

$A = \{1, 2, 3, 4\}$ by Hasse diagram