



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

InSem Examination-I Winter2024	
Exam Seat No.:	
Academic Year:2024-2025	Semester:III
Class:SY	Program:B.Tech
Branch Code:ADS/COM/CSD	Pattern:2023
Name of Course:Discrete Structures	Course Code:2301201
Max. Marks:30	Duration:1.15 Hrs.

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 2 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 and level of Blooms Taxonomy of the Question/sub-question.

Marks CO

Question No. 1

- 1 a) Show that $\neg(p \wedge (q \vee r)) \vee (\neg p \wedge \neg q)$ and $\neg p \vee (\neg q \wedge \neg r)$ are logically equivalent using laws (4) CO1
- 1 b) Make use of given encryption function to encrypt the message “ ARTIFICIAL INTELLIGENCE SCIENCE” $f(p) = (p + 3) \bmod 26$ (3) CO1

Question No. 2

- 2 a) Show that $1^3 + 2^3 + 3^3 + \dots + n^3 = \left(\frac{n(n+1)}{2}\right)^2$ (4) CO1
- 2 b) Find Conjunctive normal form of $\neg((\neg p \rightarrow \neg q) \wedge \neg r)$ using laws (4) CO1

Group OR

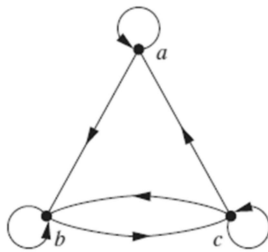
- 2 c) Explain how the Euclidean algorithm works by writing pseudo code and find GCD of 5686 and 2682 using Euclidean algorithm (4) CO1
- 2 d) Find Conjunctive normal form of $(p \rightarrow q) \rightarrow (\neg r \wedge q)$ using laws (4) CO1

Question No. 3

- 3 a) Show relation $R = \{(a,b) \mid a \leq b\}$ on sets $A = \{7, 8, 9, 10, 11, 13\}$ in digraph and matrix forms. (4) CO2
Verify partial ordering property of R
- 3 b) Determine transitive closure of relation $R = \{(a, a), (a, d), (b, b), (c, d), (d, a), (a, c), (d, d)\}$ on set $S = \{a, b, c, d\}$ (3) CO2

Question No. 4

- 4 a) Draw the Hasse diagram representing the partial ordering $\{(x,y) \mid x \text{ divides } y\}$ set $X = \{2, 3, 6, 12, 24, 36\}$. (4) CO2
- 4 b) Determine whether the relations for the directed graphs shown in following figure are reflexive, symmetric, antisymmetric. Represent the relation in ordered pair and matrix form. (4) CO2



Group OR

4 c) Determine if the given poset is a lattice. Consider the poset where $S = \{1, 2, 3, 6\}$ with relation $R = \{(a, b) \mid a \mid b\}$ (4) CO2

4 d) Find the expression for $(h \circ g \circ f)(x)$, where $f(x) = 2x - 3$, $g(x) = x^2 + 1$, and $h(x) = 1/x$. (4) CO2

..... End of question paper.....