

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION DECEMBER 2023
(Second Semester)

Branch – COMPUTER SCIENCE WITH DATA ANALYTICS
DISCRETE STRUCTURES & GRAPH THEORY

Time: Three Hours

Maximum: 50 Marks

SECTION-A (5 Marks)

Answer ALL questions

ALL questions carry EQUAL marks (5 x 1 = 5)

- Which of the following set is a successor set of $\{\phi\}$.
i) $\{\phi\}$ ii) ϕ iii) $\{\phi, \{\phi\}\}$ iv) $\phi, \{\phi\}$
- If $\langle A, \leq \rangle$ is a partially ordered set and A is a chain, then $\langle A, \leq \rangle$ is called _____.
i) Ordered set ii) Totally Ordered set
iii) Chain iv) Anti-chain
- "A premise may be introduced at any point in the derivation this rule is called _____.
i) Rule P ii) Rule T
iii) Rule CP iv) None of these
- If graph G is Eulerian then all the vertices of G is of _____.
i) Odd degree ii) Even degree iii) Zero degree iv) One degree
- A Graph in which there is _____ between every pair of vertices in a tree.
i) No path ii) One path iii) Two paths iv) Three paths

SECTION - B (15 Marks)

Answer ALL Questions

ALL Questions Carry EQUAL Marks (5 x 3 = 15)

- a Show that $2^n > n^3$ for $n \geq 10$, by principle of Mathematical Induction
OR
b Determine the number of ways to seat five boys in a row of 12 chairs.
- a Let $R = \{(1, 2), (3, 4), (2, 2)\}$, and $S = \{(4, 2), (2, 5), (3, 1), (1, 3)\}$ Find $RoS, SoR, Ro(SoR)$ (RoS) oR, RoR, SoS .
OR
b Define (i) Partially ordered set (ii) Lattice.
- a Show that the following equivalence: $P \rightarrow (Q \rightarrow P) \Leftrightarrow \neg P \rightarrow (P \rightarrow Q)$.
OR
b Write down the rules for inference theory.
- a Discuss the Konigsberg bridge problem.
OR
b Discuss (i) Eulerian Path (ii) Hamilton Path.
- a Discuss the rooted trees.
OR
b Prove that every circuit has an even number of edges in common with every cut- set.

Cont...

SECTION -C (30 Marks)

Answer ALL questions

ALL questions carry EQUAL Marks (5 x 6 = 30)

11. a Show that $n^3 + 2n$ is divisible by 3 for all $n \geq 1$, by Mathematical induction.
OR
b Find the number of paths for a rook to move from the south-west corner of a chessboard to north east corner by moving eastward and northward only.
12. a List the properties of relation with example.
OR
b Show that composition at functions is associative.
13. a Obtain the product of sums canonical form of $(P \wedge Q) \vee (\neg P \wedge R)$.
OR
b Show that $S \vee R$ is tautologically implied by $(P \vee Q) \wedge (P \rightarrow R) \wedge (Q \rightarrow S)$.
14. a In a Graph with n vertices, there is a path from vertex V_1 to vertex V_2 , prove that the path no more than $n - 1$ edges from vertex V_1 to vertex V_2 .
OR
b Discuss the travelling sales person problem.
15. a Prove that the number of vertices one more than the number of edges in a tree.
OR
b Prove that a connected graph contain a spanning tree.

Z-Z-Z

END