PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)
BSc DEGREE EXAMINATION DECEMBER 2019
(Fifth Semester)

Branch – **MATHEMATICS WITH COMPUTER APPLICATIONS**

DISCRETE MATHEMATICS AND GRAPH THEORY

Time : Three Hours Maximum : 75 Marks

SECTION-A (20 Marks)
Answer **ALL** questions
ALL questions carry **EQUAL** marks (10 x 2 = 20)

1 Write any two declarative statements.
2 Show that the statement $p \vee \sim p$ is a tautology.
3 Define a binary relation and give an example.
4 Define power of a relation and give an example.
5 Define a lower bound and upper bound in latticea.
6 Define a sublattice and give an example.
7 Explain a graph with example.
8 Draw a graph containing isolated vertices, series edges and pendant vertex and index them.
9 Define decomposition of a graph.
10 Define a tree and give an example.

SECTION - B (25 Marks)
Answer **ALL** Questions
ALL Questions Carry **EQUAL** Marks (5 x 5 = 25)

11 a Check the contingency of the statement $(p \wedge \sim q) \vee (\sim p \wedge q)$.
OR
b Explain the method of testing the validity of an argument.

12 a Define an equivalence relation. Give an example.
OR
b If R is the set of all real numbers, discuss the type of function defined by f : $R \to R$ such that $f(x)=x^2$ for all $x \in R$.

13 a Let $(L,\leq)$ be a lattice. Prove that (i) $b \leq c \Rightarrow \begin{cases} a \wedge b \leq a \wedge c \\ a \vee b \leq a \vee c \end{cases}$ for every $a,b,c \in L$.
OR
b Prove that every finite lattice L is bounded.

14 a Solve seating problem of nine members using graphs, with suitable graph.
OR
b Prove that a simple graph with n vertices and k components can have at most $\frac{(n-k)(n-k+1)}{2}$ edges.

15 a Prove that a tree with n vertices has (n-1) edges.
OR
b Prove that every connected graph has at least one spanning tree.

SECTION - C (30 Marks)
Answer any **THREE** Questions
ALL Questions Carry **EQUAL** Marks (3 x 10 = 30)

16 Prove that, using truth table, (i) $p \vee (q \vee r) \equiv (p \vee q) \vee r$ (ii) $p \wedge (q \wedge r) \equiv (p \wedge q) \wedge r$.

Cont...

17 If R is a relation on a set A, prove that
(i)When R is a reflexive, R^{-1} is also reflexive.
(ii)R is symmetric if and only if $R = R^{-1}$.
(iii)R is anti-symmetric if and only if $R \cap R^{-1} \subseteq I_A$.

18 Prove that two bounded lattices L_1 and L_2 are complemented if and only if $L_1 x L_2$ is complemented.

19 A graph G is disconnected if and only if its vertex set V can be partitioned into two nonempty, disjoint subsets V_1 and V_2 such that there exists no edge in G whose one end vertex is in subset V_1 and the other in subset V_2. Prove!

20 Prove that a given connected graph G is an Euler graph if and only if all vertices of G are of even degree and hence derive the solution of Konigsberg Bridge problem.

Z-Z-Z END