18MCU32

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION MAY 2022
(Sixth Semester)

Branch – **MATHEMATICS WITH COMPUTER APPLICATIONS**

DISCRETE MATHEMATICS AND GRAPH THEORY

Time: Three Hours | Maximum: 75 Marks

SECTION-A (10 Marks)
Answer **ALL** questions
ALL questions carry **EQUAL** marks (10 x 1 = 10)

1 $(P \wedge \neg P) \vee Q$ is equivalent to ____________
(i) Q (ii) $\neg P \vee Q$
(iii) $P \wedge \neg P$ (iv) P

2 In Normal forms, the word 'Product' is used in the place of ________.
(i) Disjunction (ii) Conjunction
(iii)Conditional (iv) Biconditional

3 Introduction of a premise at any stage of derivation is rule __________.
(i) T (ii) P
(iii) CP (iv) US

4 Symbolize the statement " x is a man and y is a mortal", where M(x) : x is a man
H(y) : y is a mortal
(i) M(x) ∧ H(y) (ii) M(x) ∨ H(y)
(iii) M(x) → H(y) (iv) M(x) ∧ ~H(y)

5 Determine the characteristics of the relation aRb if $a^2=b^2$
(i) Transitive and Symmetric (ii) Reflexive and Asymmetry
(iii) Antisymmetry and Irreflexive(iv) Symmetric, Reflexive and Transitive

6 The number of equivalence relations of the set {3,6,9,12,18} is
(i) 4 (ii) 2^5
(iii) 22 (iv) 10

7 The degree of any vertex of graph is
(i) Number of vertex in a graph
(ii) The number of edges incident with vertex
(iii) The number of edges in a graph
(iv) Number of vertices adjacent to that vertex

8 If the origin and terminus of a walk are same, the walk is known as
(i) Open (ii) Closed
(iii) Path (iv) Chain

9 The maximum number of edges in a bipartite graph on 12 vertices is
(i) 36 (ii) 24
(iii) 6 (iv) 12

10 If G is a forest with n vertices and K connected components, then how many edges does G have?
(i) n/k (ii) n-k
(iii)n-k+1 (iv)n-k-1

Cont...

SECTION - B (25 Marks)

Answer **ALL** questions
ALL questions carry **EQUAL** Marks (5 x 5 = 25)

11 a Show that $(P \to Q) \Leftrightarrow (\neg P \vee Q)$

OR

b Show that the formula $Q \vee (P \wedge \neg Q) \vee (\neg P \wedge \neg Q)$ is a tautology.

12 a Show $I_{12} : \neg Q, P \to Q \Rightarrow \neg P$

OR

b Show that $(x)(P(x) \to Q(x)) \wedge (x)(Q(x) \to R(x)) \Rightarrow (x)(P(x) \to R(x))$.

13 a Let X={1,2,3,4} and R={‹x,y›/x>y}. Draw the graph of R and also its matrix.

OR

b Let R and S be two relations on a set of positive integers I:R={‹x,2x›/x∊I} S={‹x,7x›/x ∊ I}. Find R□ S, R□ R, R□ R□ R and R□ S□ R.

14 a Explain any one applications of graph theory.

OR

b Define subgraph with an example and write some observations of subgraph.

15 a Define Euler graph and Hamiltonian circuit and draw a graph in which an Euler line is also a Hamiltonian circuit.

OR

b Prove that there is one and only one path between every pair of vertices in a tree T.

SECTION -C (40 Marks)

Answer **ALL** questions
ALL questions carry **EQUAL** Marks (5 x 8 = 40)

16 a Show that (i) $\neg(P \wedge Q) \to (\neg P \vee (\neg P \vee Q) \Leftrightarrow (\neg P \vee Q)$
(ii) $(P \vee Q) \wedge (\neg P \wedge (\neg P \wedge Q) \Leftrightarrow (\neg P \wedge Q)$

OR

b Obtain the principal disjunctive normal forms of
(i) $\neg(P \vee Q)$
(ii) $(P \wedge Q) \vee (\neg P \wedge R) \vee (Q \wedge R)$

17 a Show that the following premises are inconsistent.
1. If Jack misses many classes through illness, then he fails high school.
2. If Jack fails high school, then he is uneducated.
3. If Jack reads a lot of books, then he is not uneducated.
4. Jack misses many classes through illness and reads a lot of books.

OR

b Show that $(x)(P(x) \vee Q(x)) \Rightarrow (x)P(x) \vee (\exists x)Q(x)$

18 a Discuss the properties of Binary relations in a set with a suitable example.

OR

b Let F_x be the set of all one-to-one onto mappings from X onto X, where X={1,2,3}. Find all the elements of F_x and find the inverse of each element.

19 a Draw any two graphs and discuss the isomorphism.

OR

b Prove that a simple graph (i.e., a graph without parallel edges or self-loops) with n vertices and k component can have at most $(n-k)(n-k+1)/2$ edges.

20 a Discuss the various operations between graphs with an example.

OR

b Prove that a graph is a tree if and only if it is minimally connected.

Z-Z-Z

END