18SSP11

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

MSc (SS) DEGREE EXAMINATION MAY 2023
(Second Semester)

Branch – **SOFTWARE SYSTEMS**
(Five years Integrated)

MATHEMATICS - II

Time: Three Hours Maximum: 75 Marks

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

1 Any statement without the connectives is called_____.
(i) Statement (ii) Atomic statement
(iii) Compound statement (iv) Argument

2 PVTP is always
(i) Tautology (ii) Contradiction
(iii) Contrapositive (iv) None of the above

3 ~p => _____.
(i) P (ii) Q
(iii) P→Q (iv) Q→P

4 Rule CP is also called _____theorem.
(i) Equivalence (ii) Contradiction
(iii) Reduction (iv) Deduction

5 The solution to a transportation problem with 5 sources and 4 destinations is feasible if number of positive allocations are_____.
(i) 12 (ii) 11
(iii) 9 (iv) 8

6 An Assignment problem can be solved by_____.
(i) transportation method (ii) simplex method
(iii) both (i) and (ii) (iv) none of the above

7 A graph that has neither self-loops nor parallel edges is called a_____.
(i) complete graph (ii) simple graph
(iii) general graph (iv) linear graph

8 A _____ in a connected graph G is said to be Hamiltonian if it includes every vertex of G.
(i) walk (ii) vertex
(iii) circuit (iv) path

9 Any connected graph with n vertices and n-1 edges is a ____.
(i) pendant (ii) walk
(iii) tree (iv) vertex

10 The number of vertices n in a binary tree is always _____.
(i) odd (ii) even
(iii) one (iv) zero

Cont...

SECTION - B (25 Marks)

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

11 a Show that $(\neg P \wedge (\neg Q \wedge R)) \vee (Q \wedge R) \vee (P \wedge R)) \Leftrightarrow R$.

OR

b Construct the truth table for the following statement formula (i) $P \vee \neg Q$ (ii) $(P \vee Q) \vee \neg P$.

12 a Determine the principal disjunctive normal forms of $(P \wedge Q) \vee (\neg P \wedge R) \vee (Q \wedge R)$.

OR

b Show that $R \wedge (P \vee Q)$ is a valid conclusion from the premises $P \vee Q$, $Q \rightarrow R$, $P \rightarrow M$ and $\neg M$.

13 a Determine an initial basic feasible solution to the following T.P using VAM method

	D1	D2	D3	D4	Supply
S1	20	25	28	31	200
S2	32	28	32	41	180
S3	18	35	24	32	110
Demand	150	40	180	170	

OR

b A department head has four tasks to be performed and three subordinates, the subordinates differ in efficiency. The estimates of the time, each subordinate would take to perform, is given below in the matrix. How should he allocate the tasks one to each man, so as to minimize the total man-hours?

Task	*Men*		
	1	**2**	**3**
I	9	26	15
II	13	27	6
III	35	20	15
IV	18	30	20

14 a Show that the number of vertices of odd degree in a graph is always even.

OR

b Prove that in a complete graph with n vertices there are (n-1)/2 edge-disjoint Hamiltonian circuits, if n is an odd number ≥ 3.

15 a Prove that a graph G with n vertices, (n-1) edges and no circuit is connected.

OR

b Prove that every tree has either one or two centers.

SECTION -C (40 Marks)

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

16 a Prove that $((P \vee Q) \wedge \neg (\neg P \wedge (\neg Q \vee \neg R))) \vee (\neg P \wedge \neg Q) \vee (\neg P \wedge \neg R)$ is a tautology without using truth table.

OR

b Prove that $\neg (P \wedge Q) \rightarrow (\neg P \vee (\neg P \vee Q)) \Leftrightarrow (\neg P \vee Q))$ and hence by duality law prove that $(P \vee Q) \wedge (\neg P \wedge (\neg P \wedge Q)) \Leftrightarrow (\neg P \wedge Q)$.

17 a Determine the principal conjunctive normal form and principal disjunctive normal form of the proposition $(7p \rightarrow R) \wedge (Q \leftrightarrow P)$.

OR

b Show that (S V R) is tautologically implied by (P V Q) Λ (P→R) Λ (Q→S).

18 a Determine the optimum basic feasible solution to the following Transportation problem using MODI method.

		Destinations			**Supply**
Origins	6	1	9	3	70
	11	5	2	8	55
	10	12	4	7	90
Demand	85	35	50	45	

OR

b In the modification of a plant layout of a factory, four new machines M, N, O and P are to be installed in a machine shop. There are five vacant places A, B, C, D and E available. Because of limited space, machine N cannot be placed at C and O cannot be placed at A. The cost of placing of machine *i* at place *j* (in hundred rupees) is shown below:

Location

Machine	**A**	**B**	**C**	**D**	**E**
M	9	11	15	10	11
N	12	9	-	10	9
O	-	11	14	11	7
P	14	8	12	7	8

Determine the optimal assignment schedule

19 a Prove that a simple graph with n vertices and k components can have at most (n-k) (n-k+1)/2 edges.

OR

b Prove that a connected graph G is an Euler graph if and only if it can be decomposed into circuits.

20 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.

Z-Z-Z END