PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

MSc DEGREE EXAMINATION MAY 2022
(Second Semester)

Branch – **SOFTWARE SYSTEMS**
(Five Year 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 PVTP is always
(i) Tautology (ii) Contradiction
(iii) Contrapositive (iv) None of the above

2 $PV(P \wedge Q) \Leftrightarrow P$ is known as
(i) Idempotent law (ii) Absorptism law
(iii) Distributive law (iv) De-Morgan law

3 DNF of $P \wedge (P \rightarrow Q)$ is
(i) $PV(P \wedge Q)$ (ii) $(P \wedge 7P)V(P \wedge Q)$
(iii) $P \wedge (7P \wedge Q)$ (iv) $P \rightarrow (P \wedge Q)$

4 A set of premises $H_1, H_2, H_3 \ldots H_n$ is said to be inconsistent, if their conjunction implies a _____
(i) Tautology (ii) Contradiction
(iii) Neither (i) nor (ii) (iv) Either (i) or (ii)

5 The solution to a transportation problem with 4 sources and 3 destinations is feasible if number of positive allocations are
(i) 12 (ii) 7
(iii) 6 (iv) 5

6 The method used for solving an assignment problem is called
(i) Reduced matrix method (ii) MODI method
(iii) Hungarian method (iv) None of these

7 Maximum number of edges in a simple graph with 6 vertices is
(i) 15 (ii) 12
(iii) 18 (iv) 21

8 A connected graph contains an Euler path iff it has exactly _____ vertices of odd degree
(i) 2 (ii) 3
(iii) 4 (iv) 6

9 The number of pendant vertices of a binary tree with 7 vertices is
(i) 3 (ii) 4
(iii) 8 (iv) 5

10 Number of chords of a connected graph with 6 vertices and 9 edges with respect to a spanning tree is
(i) 3 (ii) 4
(iii) 5 (iv) 6

Cont...

SECTION - B (25 Marks)

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

11 a Show that $P \to (Q \to R) \Leftrightarrow P \to (7QVR) \Leftrightarrow (P \wedge Q) \to R$.

OR

b Show that $(7P \wedge (7Q \wedge R)) \vee (Q \wedge R) \vee (P \wedge R) \Leftrightarrow R$.

12 a Obtain DNF of $7(P \vee Q) \Leftrightarrow (P \wedge Q)$

OR

b Demonstrate that R is a valid inference from the premises $P \to Q$, $Q \to R$ and P.

13 a Explain Lowest Cost method for finding initial solution of a transportation problem.

OR

b A computer centre has three expert programmers. The Centre wants three application programmes to be developed. The head of the computer centre, after studying carefully the programmes to be developed, estimates the computer time in minutes required by the experts for the application programmes as follow:

		Programmers		
		A	B	C
Programmes	1	120	100	80
	2	80	90	110
	3	110	140	120

Assign the programmers to the programmes in such a way that the total computer time is minimum.

14 a Prove that the total number of edges in a complete graph K_n is $\frac{n(n-1)}{2}$.

OR

b Explain briefly about Konigsberg Bridge problem.

15 a Prove that there is only one path between every pair of vertices in a Tree T.

OR

b Prove that the number of vertices of degree 3 in a binary tree with n vertices is $\frac{(n-3)}{2}$.

SECTION -C (40 Marks)

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

16 a Show that $((P \vee Q) \wedge 7(7P \wedge (7Q \vee 7R))) \vee (7P \wedge 7Q) \vee (7P \wedge 7R)$ is a tautology without using truth table.

OR

b Prove that $7(P \wedge Q) \to (7P \vee (7P \vee R)) \Leftrightarrow (7P \vee Q)$ and hence by duality law prove that $(P \vee Q) \wedge (7P \wedge (7P \wedge Q)) \Leftrightarrow (7P \wedge Q)$.

17 a Obtain PCNF of the formula S given by $(7P \to R) \wedge (Q \leftrightarrow P)$.

OR

b Show that SVR is tautologically implied by $(P \vee Q) \wedge (P \to R) \wedge (Q \to S)$.

18 a Goods have to be transported from sources S_1, S_2 and S_3 to destinations D_1, D_2 and D_3. The transportation cost per unit, capacities of the sources and requirements of the destinations are given in the following table.

	D_1	D_2	D_3	Supply
S_1	8	5	6	120
S_2	15	10	12	80
S_3	3	9	10	80
Demand	150	80	50	

Determine a transportation schedule so that the cost is minimized.

OR

b A department has five employees with five jobs to be performed. The time in (hours) each men will take to perform each job is given in the effectiveness matrix.

		Employees				
		I	II	III	IV	V
Jobs	A	10	5	13	15	16
	B	3	9	18	13	6
	C	10	7	2	2	2
	D	7	11	9	7	12
	E	7	9	10	4	12

How should the jobs be allocated, one per employee, so as to minimize the total man hours?

19 a Prove that the number of odd degree vertices is always even.

OR

b Prove that if a graph (connected or disconnected) has exactly two vertices of odd degree then there must be a path joining these two vertices.

20 a Prove that a tree with n vertices has (n-1) edges.

OR

b Prove that the number of vertices in a binary tree is always odd.

Z-Z-Z END