

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

MSc(SS) DEGREE EXAMINATION DECEMBER 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)

- If A is any statement, then which of the following is a tautology?
(i) $A \wedge F$ (ii) $A \vee F$ (iii) $A \vee \neg A$ (iv) $A \wedge T$
- Which of the following represents: $\sim A$ (negation of A) if A stands for "I like badminton but hate maths"?
(i) I hate badminton and maths (ii) I do not like badminton or math
(iii) I dislike badminton but love maths (iv) I hate badminton or like maths
- $p \rightarrow q$ is logically equivalent to _____
(i) $\neg p \vee \neg q$ (ii) $p \vee \neg q$ (iii) $\neg p \vee q$ (iv) $\neg p \wedge q$
- Which rule of inference is used, "Bhavika will work in an enterprise this summer. Therefore, this summer Bhavika will work in an enterprise or he will go to beach."
(i) Simplification (ii) Conjunction
(iii) Addition (iv) Disjunctive syllogism
- When the allocations of a transportation problem (T.P) satisfy the rim condition ($m + n - 1$) the solution is called _____ solution.
(i) degenerate (ii) infeasible (iii) unbounded (iv) non-degenerate
- An assignment problem is considered as a particular case of transportation problem, because
(i) all the rim conditions are 1 (ii) all are either 1 or 0
(iii) the number of rows equals columns (iv) all of the above
- The degree of any vertex of graph is _____
(i) The number of edges incident with vertex (ii) number of vertex in a graph
(iii) number of vertices adjacent to that vertex (iv) number of edges in a graph
- A graph with no edges is known as empty graph. Empty graph is also known as _____.
(i) Trivial graph (ii) Regular graph
(iii) Bipartite graph (iv) planar graph
- A graph is a tree if and only if it
(i) is completely connected (ii) is planar
(iii) contains a act (iv) is minimally connected
- A circuit in a connected graph which includes every vertex of the graph is called
(i) Hamilton (ii) Cheque (iii) Universal (iv) Euler

SECTION - B (25 Marks)

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

- a Construct the truth table for $(P \rightarrow Q) \wedge (Q \rightarrow P)$.
(OR)
b Show that the formula $Q \vee (P \wedge \neg Q) \vee (\neg P \wedge \neg Q)$ is a tautology.

Cont...

12 a Explain elementary product and conjunctive normal form.

(OR)

b Show that $R \rightarrow S$ can be derived from the premises $P \rightarrow (Q \rightarrow S)$, $\sim R \vee P$ and Q .

13 a Determine an initial basic feasible solution to the following transportation problem using North- West Corner method:

	D ₁	D ₂	D ₃	D ₄	Availability
O ₁	5	3	6	2	19
O ₂	4	7	9	1	37
O ₃	3	4	7	5	34
Demand	16	18	31	25	

(OR)

b Solve the following assignment problems:

	A	B	C	D
I	1	4	6	3
II	9	7	10	9
III	4	5	11	7
IV	8	7	8	5

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

(OR)

b In a graph (connected or disconnected), has exactly two vertices of odd degree, there must be a graph joining these two vertices.

15 a Prove that every tree has either one or two centres.

(OR)

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

SECTION -C (40 Marks)

Answer ALL questions

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

16 a Show that $(\sim p \wedge (\sim Q \wedge R)) \vee (Q \wedge R) \vee (P \wedge R) \Leftrightarrow R$ without using truth table.

(OR)

b Prove that $\sim(P \wedge Q) \rightarrow (\sim P \vee Q) \Leftrightarrow (\sim P \vee Q)$.

17 a Obtain the principle disjunctive normal form of $P \rightarrow ((P \rightarrow Q) \wedge (\neg Q \vee P))$.

(OR)

b Show that the following are equivalent formulas

i) $P \vee (P \wedge Q) \Leftrightarrow P$ and ii) $P \vee (\neg P \wedge Q) \Leftrightarrow P \vee Q$

18 a Solve the following Transportation problem:

Source	Destination				Available
	1	2	3	4	
1	21	16	25	13	11
2	17	18	14	23	13
3	32	27	18	41	19
Requirement	6	10	12	15	43

(OR)

Cont...

- 18 b A departmental head has four subordinates, and four tasks to be performed. The subordinates differ in efficiency, and the tasks differ in their intrinsic difficulty. His estimate, of the time each man would take to perform each task, is given in the matrix below:

Tasks	Men			
	E	F	G	H
A	18	26	17	11
B	13	28	14	26
C	38	19	18	15
D	19	26	24	10

- 19 a A simple graph with n vertices and k components can have atmost $(n-k)(n-k+1)$ edges.

(OR)

- b Define i) isolated vertex ii) perdent vertex iii) Null graph iv) connected graph

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

(OR)

- b Show that every connected graph has atleast one spanning tree.

Z-Z-Z

END