

**PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)**

**BSc & BCA DEGREE EXAMINATION MAY 2026
(Second Semester)**

Common to Branches – **INFORMATION TECHNOLOGY & COMPUTER APPLICATIONS**

MATHEMATICAL FOUNDATIONS OF COMPUTING

Time: Three Hours

Maximum: 75 Marks

SECTION-A (10 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** marks

(10 × 1 = 10)

Module No.	Question No.	Question	K Level	CO
1	1	What is the maximum possible rank of 2 x 3 matrix (i) 1 (ii) 2 (iii) 3 (iv) 6	K1	CO1
	2	Which matrix satisfies its own characteristic equation? (i) row (ii) column (iii) square (iv) rectangular	K2	CO1
2	3	Let P: We should be honest. Q: We should be dedicated., R: We should be overconfident. Then 'We should be honest or dedicated but not overconfident.' is best represented by? (i) $\sim P \vee \sim Q \vee R$ (ii) $P \wedge \sim Q \wedge R$ (iii) $P \vee Q \wedge R$ (iv) $P \vee Q \wedge \sim R$	K1	CO2
	4	If A is any statement, then which of the following is a tautology? (i) $A \wedge F$ (ii) $A \vee F$ (iii) $A \vee \sim A$ (iv) $A \wedge T$	K2	CO2
3	5	A graph is said to be connected if: (i) It has no edge (ii) Every vertex has degree 1 (iii) There is a path between every pair of vertices (iv) It contains a cycle	K1	CO3
	6	A spanning subgraph of G is a subgraph that: (i) Contains all vertices of G (ii) Contains all edges of G (iii) Is a complete graph of G (iv) Is a Path	K2	CO3
4	7	What is the main disadvantage of the Gauss-Jacobi method compared to the Gauss-Seidel method? (i) It requires more memory (ii) It cannot be parallelized (iii) It usually converges slower (iv) It is not suitable for large systems	K1	CO4
	8	Gauss Seidel converges only when the coefficient matrix is _____ (i) upper triangular (ii) lower triangular (iii) diagonally dominant (iv) Banded matrix	K2	CO4
5	9	For Simpson's 3/8th rule, the number of subintervals must be a multiple of: (i) 2 (ii) 3 (iii) 4 (iv) 6	K1	CO5
	10	What is the order of error in the Trapezoidal rule ? (i) h (ii) h^2 (iii) h^3 (iv) h^4	K2	CO5

SECTION - B (35 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** Marks

(5 × 7 = 35)

Module No.	Question No.	Question	K Level	CO
1	11.a.	For what value of K is the matrix $\begin{pmatrix} 6 & 3 & 5 & 9 \\ 5 & 2 & 3 & 6 \\ 0 & 1 & 2 & 3 \\ 2 & 1 & 1 & K \end{pmatrix}$ of rank 3?	K2	CO1
		(OR)		
	11.b.	Show that the equations $2x - y + z = 7, 3x + y - 5z = 13, x + y + z = 5$ are consistent and solve them.		

Cont...

2	12.a.	Use the truth tables method to determine whether $(p \rightarrow q) \vee (p \rightarrow \sim q)$ is valid.	K3	CO2
	(OR)			
	12.b.	Show that the following statement is a tautology $[(p \rightarrow q) \wedge (q \rightarrow r)] \rightarrow (p \rightarrow r)$.		
3	13.a.	State and prove handshaking theorem.	K2	CO3
	(OR)			
	13.b.	Explain about the following graph operations with examples i) Union of graphs ii) Intersection of graphs iii) Complement of a graph		
4	14.a.	Solve the following system of equations using Gauss – Elimination Method. $2x + y + 4z = 12$ $8x - 3y + 2z = 20$ $4x + 11y - z = 33$	K3	CO4
	(OR)			
	14.b.	Solve the following system of equations using Gauss – Jordon Method. $x + 2y + z = 3$ $2x + 3y + 3z = 10$ $3x - y + 2z = 13$		
5	15.a.	Dividing the range the 10 equal parts, find the approximate value of $\int_0^\pi \sin x \, dx$ by Simpson's 1/3rd rule.	K3	CO5
	(OR)			
	15.b.	Evaluate $\int_0^5 \frac{dx}{4x+5}$ by Trapezoidal rule using 11 coordinates.		

SECTION -C (30 Marks)

Answer ANY THREE questions

ALL questions carry EQUAL Marks (3 × 10 = 30)

Module No.	Question No.	Question	K Level	CO														
1	16	Find the Eigen values and Eigen vectors for $\begin{pmatrix} 2 & 2 & 0 \\ 2 & 1 & 1 \\ -7 & 2 & -3 \end{pmatrix}$.	K2	CO1														
2	17	Show that $(p \wedge q) \wedge \sim(p \vee q)$ is a fallacy or contradiction.	K3	CO2														
3	18	a) Explain the following types of graphs with examples i) Null graph ii) Complete graph iii) Regular graph iv) Bipartite graph b) Discuss about Isomorphism of graphs with an example	K3	CO3														
4	19	Solve by Gauss seidel Method. $28x + 4y - z = 32$; $x + 3y + 10z = 24$; $2x + 17y + 4z = 35$	K3	CO4														
5	20	Find the first two derivatives of $\sqrt[3]{x}$ at $x=50$ from the table. <table><tr><td>x</td><td>50</td><td>51</td><td>52</td><td>53</td><td>54</td><td>55</td></tr><tr><td>y</td><td>3.6840</td><td>3.7084</td><td>3.7325</td><td>3.7563</td><td>3.7798</td><td>3.8030</td></tr></table>	x	50	51	52	53	54	55	y	3.6840	3.7084	3.7325	3.7563	3.7798	3.8030	K3	CO5
x	50	51	52	53	54	55												
y	3.6840	3.7084	3.7325	3.7563	3.7798	3.8030												