

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

**BSc DEGREE EXAMINATION DECEMBER 2024
(First Semester)**

Common to Branches - **COMPUTER SCIENCE & COMPUTER TECHNOLOGY**

MATHEMATICS FOR COMPUTING - I

Time: Three Hours

Maximum: 75 Marks

SECTION-A (10 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** marks

(10 × 1 = 10)

Question No.	Question	K Level	CO
1	What is the rank of the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 5 \end{bmatrix}$? a) 1 b) 2 c) 3 d) none	K1	CO1
2	In a system of m linear equations in n unknowns ($m \geq n$), if $r(A, B) = r(A) = n$, the equations are consistent and they have _____. a) unique solution b) infinite number of solutions c) m number of solutions d) n number of solutions	K2	CO1
3	If the auxiliary equation is an nth degree algebraic equation in m and the roots of the auxiliary equation are real and distinct then the complementary function is _____. a) $u = c_1 e^{m_1 x} + c_2 e^{m_2 x} + \dots + c_m e^{m_m x}$ b) $u = (c_1 x + c_2) e^{m_1 x} + c_3 e^{m_3 x} + \dots + c_m e^{m_m x}$ c) $u = c_1 e^{m_1 x} + c_2 e^{m_2 x} + \dots + c_m e^{m_n x}$ d) $u = c_1 e^{m_1 x} + c_2 e^{m_2 x} + \dots + c_m e^{m_n x}$	K1	CO2
4	A solution of a partial differential equation which contains as many arbitrary functions as the order of the equation is called the _____ integral. a) complete b) singular c) general d) Particular	K2	CO2
5	The rate of convergence of Gauss-Seidal method is roughly _____ that of Gauss-Jacobi method. a) Half b) Equal to c) Faster than d) twice	K1	CO3
6	Which of the following is the indirect method? a) Gauss-Jacobi method b) Gauss-Jordan method c) Gauss-Elimination method d) both © and (a)	K2	CO3
7	The error in the Trapezoidal formula is of the order _____. a) h b) h^2 c) h^3 d) 1	K1	CO4
8	If the value of $\frac{dy}{dx}$ is required at a point near the beginning of the table we use _____ formula. a) Newton-Gregory forward b) Newton-Gregory backward c) Central difference d) Stirling's	K2	CO4
9	In the fourth-order Runge-Kutta method, the final value of y_{n+1} is computed using a weighted average of how many intermediate slopes? a) 2 b) 3 c) 4 d) 5	K1	CO5
10	Which of the following formula is a particular case of Runge-Kutta formula of the second order? a) Taylor series method b) Picard's formula c) Milne's predictor formula d) Euler's modified formula	K2	CO5

Cont....

SECTION - B (35 Marks)

Answer ALL questions

ALL questions carry EQUAL Marks (5 × 7 = 35)

Question No.	Question	K Level	CO																		
11.a.	Show that the following equations $2x - y + z = 7$, $3x + y - 5z = 13, x + y + z = 5$ are consistent and solve them.	K2	CO1																		
(OR)																					
11.b.	Find the rank of the matrix $A = \begin{bmatrix} 6 & 1 & 1 & 1 \\ 16 & 1 & -1 & 5 \\ 7 & 2 & 3 & 0 \end{bmatrix}$.																				
12.a.	Solve $(D^2 + 5D + 4)y = e^{-x} \sin 2x$.	K4	CO2																		
(OR)																					
12.b.	Solve the equation $z^4 q^2 - z^2 p = 1$.																				
13.a.	Solve the following equations by Gauss-Jordan method: $2x - 3y + z = -1; x + 4y + 5z = 25; 3x - 4y + z = 2$.	K4	CO3																		
(OR)																					
13.b.	Solve by Gauss-elimination method the equations $2x + y + 4z = 12; 8x - 3y + 2z = 20; 4x + 11y - z = 33$.																				
14.a.	Using the following data, find $f'(5)$ <table><tr><td>x:</td><td>0</td><td>2</td><td>3</td><td>4</td><td>7</td><td>9</td></tr><tr><td>f(x):</td><td>4</td><td>26</td><td>58</td><td>112</td><td>466</td><td>922</td></tr></table>	x:	0	2	3	4	7	9	f(x):	4	26	58	112	466	922	K3	CO4				
x:	0	2	3	4	7	9															
f(x):	4	26	58	112	466	922															
(OR)																					
14.b.	Using the trapezoidal rule, evaluate $\int_{0.6}^2 y \, dx$ from the following table: <table><tr><td>x:</td><td>0.6</td><td>0.8</td><td>1.0</td><td>1.2</td><td>1.4</td><td>1.6</td><td>1.8</td><td>2.0</td></tr><tr><td>y:</td><td>1.23</td><td>1.58</td><td>2.03</td><td>4.32</td><td>6.25</td><td>8.36</td><td>10.23</td><td>12.45</td></tr></table>	x:	0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0	y:	1.23	1.58	2.03	4.32	6.25	8.36	10.23	12.45		
x:	0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0													
y:	1.23	1.58	2.03	4.32	6.25	8.36	10.23	12.45													
15.a.	Prove that the solution for the equation $\frac{dy}{dx} = y; y(0) = 1$ yields $y_m = \left(1 + h + \frac{1}{2} h^2\right)^m$, using second order Runge-Kutta method.	K3	CO5																		
(OR)																					
15.b.	Using Euler's improved method, find the value of y when $x = 0.1$ given that $y(0) = 1$ and $y' = x^2 + y$.																				

SECTION -C (30 Marks)

Answer ANY THREE questions

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

Question No.	Question	K Level	CO
16	Find the characteristic equation of the matrix $\begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$ and hence obtain its inverse.	K4	CO1
17	Solve $(D^4 - 2D^3 + D^2)y = x^2 + e^x$.	K4	CO2
18	Solve by Gauss-Jacobi method of iteration the equations $27x + 6y - z = 85$; $6x + 15y + 2z = 72$; $x + y + 54z = 110$.	K4	CO3
19	Dividing the range into 10 equal parts, find the approximate value of $\int_0^\pi \sin x \, dx$ by (i) Trapezoidal rule (ii) Simpson's rule.	K4	CO4
20	Solve the equation $\frac{dy}{dx} = 1 - y$ with the initial condition $x = 0, y = 0$, using Euler's algorithm and tabulate the solutions at $x = 0.1, 0.2, 0.3, 0.4$. Get the solutions by Euler's improved method.	K4	CO5

Z-Z-Z END