

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BSc DEGREE EXAMINATION DECEMBER 2023
(First Semester)

Branch – COMPUTER SCIENCE WITH DATA ANALYTICS

MATHEMATICAL FOUNDATION FOR DATA SCIENCE

Time: Three Hours

Maximum: 75 Marks

SECTION-A (10 Marks)

Answer ALL questions

ALL questions carry EQUAL marks

(10 × 1 = 10)

Module No.	Questions No.	Questions	K Level	CO
1	1.	$\lim_{x \rightarrow 2} x^2 - x + 2 = \underline{\hspace{2cm}}$ a) 0 b) 1 c) 2 d) 4	K1	CO1
	2.	$\frac{d}{dx}(\sin^{-1} x) = \underline{\hspace{2cm}}$ a) $\frac{1}{\sqrt{1-x^2}}$ b) $\frac{1}{\sqrt{1+x^2}}$ c) $\frac{1}{1-x^2}$ d) $\frac{1}{1+x^2}$	K2	CO1
2	3.	$\int f(x)dx = F(x)$ means _____ a) $F(x) = f(x)$ b) $F(x) = f'(x)$ c) $F'(x) = f(x)$ d) $F'(x) = f'(x)$	K1	CO2
	4.	The integral $\int_1^{\infty} \frac{1}{x} dx$ is _____ a) convergent b) divergent c) proper integral d) finite integral	K2	CO2
3	5.	Which of the following method is said to be direct method to solve system of simultaneous equations ? a) Gauss Elimination b) Gauss Jacobi c) Newton- Raphson d) Gauss seidal	K1	CO3
	6.	As soon as a new value of a variable is found by iteration, it is used immediately in the following equations, this method is called a) Gauss Elimination b) Gauss Jacobi c) Newton- Raphson d) Gauss seidal	K2	CO3
4	7.	The technique for computing the value of the function inside the given argument is called _____. a) Interpolation b) Extrapolation c) Partial fraction d) Inverse interpolation	K1	CO4
	8.	$\nabla^2 y_2 = \underline{\hspace{2cm}}$. a) $y_2 - y_1 + y_0$ b) $y_2 - 2y_1 + y_0$ c) $2y_2 + 2y_1 + y_0$ d) $y_2 + 2y_1 + y_0$	K2	CO4

Cont...

5	9.	Newton's forward difference formula gives $\left(\frac{d^2y}{dx^2}\right)_{x=x_0} = \underline{\hspace{2cm}}$ <p>a) $\frac{1}{h}(\Delta^2 y_0 - \Delta^3 y_0 + \frac{11}{12} \Delta^4 y_0 + \dots)$ b) $\frac{1}{h^2}(\Delta^2 y_0 - \Delta^3 y_0 + \frac{11}{12} \Delta^4 y_0 + \dots)$ c) $\frac{1}{h}(\Delta^2 y_0 + \Delta^3 y_0 + \frac{11}{12} \Delta^4 y_0 + \dots)$ d) $\frac{1}{h^2}(\Delta^2 y_0 - \Delta^3 y_0 - \frac{11}{12} \Delta^4 y_0 - \dots)$</p>	K1	CO5
	10.	In Trapezoidal rule, the portion of curve is replaced by $\underline{\hspace{2cm}}$ a) straight line b) circular path c) parabolic path d) none of these	K1	CO5

SECTION B (35 Marks)

Answer ALL the questions

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

Module No.	Questions No.	Questions	K Level	CO												
1	11.a	Find $\lim_{x \rightarrow 0} \left(x^3 + \frac{\cos 5x}{10000} \right)$	K2	CO1												
		(OR)														
	11.b	State and prove Fermat's theorem.														
2	12.a	Using the properties of integral to estimate $\int_0^1 e^{-x^2} dx$	K3	CO2												
		(OR)														
	12.b	Evaluate $\int \frac{\sqrt{x+4}}{x} dx$														
3	13.a	Solve the following equations by Gauss elimination Method $2x + y + 4z = 12, 8x - 3y + 2z = 20, 4x + 11y - z = 33$	K2	CO3												
		(OR)														
	13.b	Solve the following equations by Gauss Jacobi Method $20x + y - 2z = 17, 3x + 20y - z = 18, 2x - 3y + 20z = 25$														
4	14.a	The following are data from the steam table	K2	CO4												
		<table border="1"> <tr> <td>Temperature °C</td> <td>140</td> <td>150</td> <td>160</td> <td>170</td> <td>180</td> </tr> <tr> <td>Pressure Kgf/cm²</td> <td>3.685</td> <td>4.854</td> <td>6.302</td> <td>8.076</td> <td>10.225</td> </tr> </table> <p>Using Newton's formula find the pressure of the steam for a temperature of 142°</p>			Temperature °C	140	150	160	170	180	Pressure Kgf/cm ²	3.685	4.854	6.302	8.076	10.225
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Pressure Kgf/cm ²	3.685	4.854	6.302	8.076	10.225											
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	14.b	Using a polynomial of the third degree, complete the record given below of the export of a certain commodity during five years: <table border="1"> <tr> <td>Year</td> <td>1917</td> <td>1918</td> <td>1919</td> <td>1920</td> <td>1921</td> </tr> <tr> <td>Export(in tons)</td> <td>443</td> <td>384</td> <td>-</td> <td>397</td> <td>467</td> </tr> </table>	Year	1917	1918	1919	1920	1921	Export(in tons)	443	384	-	397	467		
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5	15.a	Using the following table find $f'(5)$ $\begin{array}{cccccc} X & 0 & 2 & 3 & 4 & 7 & 9 \\ f(x) & 4 & 26 & 58 & 112 & 466 & 922 \end{array}$	K3	CO5
	(OR)			
	15.b	Find the value of $\int_3^7 x^2 \log x dx$ by Trapezoidal rule with 4 strips.		

SECTION C (30 Marks)Answer **ALL** the questions**ALL** questions carry **EQUAL** marks (3×10=30 Marks)

Module No.	Questions No.	Questions	K Level	CO
1	16	i) Find y' if $x^3 + y^3 = 6xy$ ii) Find the tangent to the folium of Descartes $x^3 + y^3 = 6xy$ at the point (3,3) iii) At what point in the first quadrant is the tangent line horizontal?	K3	CO1
2	17	i) Evaluate the Riemann sum for $f(x) = x^3 - 6x$ taking the sample points to be right endpoints and $a = 0, b = 3$ and $n = 6$ ii) Evaluate $\int_0^3 (x^3 - 6x) dx$	K3	CO2
3	18	Solve the following equations by Gauss seidal Method $27x + 6y - z = 85, 6x + 15y + 2z = 72, x + y + 54z = 110$	K3	CO3
4	19	The population of a town in the decennial census was given below. Estimate the population for the years 1985 and 1925. $\begin{array}{cccccc} \text{Year } x & 1891 & 1901 & 1911 & 1921 & 1931 \\ \text{Population } y & 46 & 66 & 81 & 93 & 101 \end{array}$ (in thousands)	K3	CO4
5	20	Evaluate $I = \int \frac{1}{1+x^2} dx$ using Trapezoidal rule with $h = 0.5, 0.25, 0.125$	K3	CO5

Z-Z-Z END