CBCS SCHEME

USN | | | | | | | | | | |

22MAR11

First Semester M.Tech. Degree Examination, Dec.2023/Jan.2024
Applied Mathematics

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Solve the system of equations $4x+10y+8z=44$, $10x+26y+26z=128$, $8x+26y+61z=214$ using Cholesky method.	10	L3	CO1
	b.	Find the inverse of the matrix using partition method, $\begin{bmatrix} 1 & 1 & 1 \\ 4 & 3 & -1 \\ 3 & 5 & 3 \end{bmatrix}$.	10	L3	CO1
		OR			
Q.2	a.	Solve the system of equation : $x_1+x_2+x_3=1$, $4x_1+3x_2-x_3=6$, $3x_1+5x_2+3x_3=4$ by triangulisation method.	10	L3	CO1
	b.	Apply Gauss Seidel iterative method to solve the system of equations, $10x_1-2x_2-x_3-x_4=3$, $-2x_1+10x_2-x_3-x_4=15$, $-x_1-x_2+10x_3-2x_4=27$, $-x_1-x_2-2x_3+10x_4=-9$	10	L3	CO1
		Module – 2			
Q.3	a.	Find the matrix of the linear transformation $T: V_3(R) \to V_2(R)$ defined by $T(x,y,z)=(x+y, y+z)$.	10	L2	CO2
	b.	Consider $f(t)=3t-5$ and $g(t)=t^2$ in the polynomial space P(t) with inner product $\langle f,g\rangle = \int_0^1 f(t)g(t).dt$. (i) Find $\langle f,g\rangle$ (ii) Find $\lVert f\rVert$ and $\lVert g\rVert$	10	L2	CO2
		OR			
Q.4	a.	Consider the subspace U of $\mathbb{R}^4$ spanned by the vectors $V_1=(1,1,1,1)$, $V_2=(1,1,2,4)$, $V_3=(1,2,-4,-3)$ Find (i) Orthogonal basis of U (ii) an orthonormal basis of U by applying Gram-Schmidt orthogonalization.	10	L2	CO2

<table>
<tr><td></td><td>b.</td><td>Find the least square solution of $AX = B$ for,
$A = \begin{bmatrix} 1 & 3 & 5 \\ 1 & 1 & 0 \\ 1 & 1 & 2 \\ 1 & 3 & 3 \end{bmatrix}, B = \begin{bmatrix} 3 \\ 5 \\ 7 \\ -3 \end{bmatrix}$</td><td>10</td><td>L2</td><td>CO2</td></tr>
<tr><td colspan="6">Module – 3</td></tr>
<tr><td>Q.5</td><td>a.</td><td>Diagonalize the matrix, $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$.</td><td>10</td><td>L3</td><td>CO3</td></tr>
<tr><td></td><td>b.</td><td>Find the largest eigen value and the eigen vector of the matrix, $\begin{bmatrix} 2 & 0 & 1 \\ 0 & 2 & 0 \\ 1 & 0 & 2 \end{bmatrix}$ by power method.</td><td>10</td><td>L3</td><td>CO3</td></tr>
<tr><td colspan="6">OR</td></tr>
<tr><td>Q.6</td><td>a.</td><td>Solve by Jacobi method, $\begin{bmatrix} 2 & \sqrt{2} & 4 \\ \sqrt{2} & 6 & \sqrt{2} \\ 4 & \sqrt{2} & 2 \end{bmatrix}$.</td><td>10</td><td>L3</td><td>CO3</td></tr>
<tr><td></td><td>b.</td><td>Find singular value decomposition of a matrix,
$A = \begin{bmatrix} 1 & 1 \\ 0 & 1 \\ -1 & 1 \end{bmatrix}$.</td><td>10</td><td>L3</td><td>CO3</td></tr>
<tr><td colspan="6">Module – 4</td></tr>
<tr><td>Q.7</td><td>a.</td><td>Define :
(i) Random sampling
(ii) Sampling distribution
(iii) Statistical hypothesis
(iv) Null hypothesis
(v) Level of significance.</td><td>10</td><td>L2</td><td>CO4</td></tr>
<tr><td></td><td>b.</td><td>Five dice are thrown 96 times and numbers 1, 2 or 3 appearing on the face of the dice follows the frequency distribution as follows :
<table><tr><td>No. of dice shown 1, 2 or 3</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td>Frequency</td><td>7</td><td>19</td><td>35</td><td>24</td><td>8</td><td>3</td></tr></table>Test the hypothesis that the data follows a binomial distribution, ($\chi^2_{0.05} = 11.07$ for 5 degree of freedom) .</td><td>10</td><td>L2</td><td>CO4</td></tr>
<tr><td colspan="6">OR</td></tr>
<tr><td>Q.8</td><td>a.</td><td>A certain stimulus administered to each of 12 patients resulted in the following increases of blood pressure 5, 2, 8, -1, 3, 0, -2, 1, 5, 0, 4, 6. Can it be concluded that the stimulus will increase the blood pressure? (Table value : $t_{0.05}$ for 11 degree of freedom = 2.201)</td><td>10</td><td>L2</td><td>CO4</td></tr>
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