SECURITY SEAL

ections: A-G

USN

NMAM INSTITUTE OF TECHNOLOGY, NITTE

(An Autonomous Institution affiliated to VTU, Belagavi)

I Sem B.E. (Credit System) Mid Semester Examinations - II, October 2017

17MA101 – ENGINEERING MATHEMATICS – I

uration: 1 Hour

Max. Marks: 20

*Note: Answer any **One** full question from **each Unit.***

		Marks	BT*
	Unit – I		
1. a)	Using the power method, find the dominant eigen values and corresponding eigen vectors of the matrix $\begin{bmatrix} 1 & 3 & -1 \\ 3 & 2 & 4 \\ -1 & 4 & 10 \end{bmatrix}$ starting with the initial value $[1 \ 0 \ 0]^T$. Carry out 5 iterations	6	L*3
b)	Reduce the quadratic form $3x^2 - 2y^2 - z^2 + 12yz + 8zx - 4xy$ to canonical form.	4	L2
2. a)	Diagonalize the matrix $A = \begin{bmatrix} 3 & 1 \\ 1 & 3 \end{bmatrix}$. Hence find A^5.	6	L3
b)	i) Define an orthogonal linear transformation. ii) If Y = AX is an orthogonal transformation with matrix A as follows $\begin{bmatrix} -2/3 & 1/3 & a/3 \\ 2/3 & 2/3 & b/3 \\ 1/3 & -2/3 & c/3 \end{bmatrix}$ find a,b,c	4	L2
	Unit – II		
3. a)	With usual notation prove that $\tan\varphi = r\frac{d\theta}{dr}$.	5	L4
b)	In the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, show that the radius of curvature at the end of the major axis is equal to the semi latus rectum.	5	L4
4. a)	Find the angle between the curves $r = a(1+\sin\theta), r = a(1-\sin\theta)$.	4	L3
b)	Verify Cauchy's mean value theorem for the functions $f(x) = \log x, g(x) = \frac{1}{x}$ in [1,e].	3	L3
c)	For the curve $\theta = \cos^{-1}\left(\frac{r}{k}\right) - \frac{\sqrt{k^2 - r^2}}{r}$, prove that $r\frac{ds}{dr}$ is a constant.	3	L4

BT* Bloom's Taxonomy, L* Level

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Sections: H-P

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Duration: 1 Hour | Max. Marks: 20

*Note: Answer any **One** full question from **each Unit**.*

			Marks	BT*
		Unit – I		
1.	a)	Find the spectral and modal matrix of $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 3 & -1 \\ 0 & -1 & 3 \end{bmatrix}$	6	L*3
	b)	i)Define a regular linear transformation. ii) Show that $y_1 = \cos\theta x_1 - \sin\theta x_2$, $y_2 = \sin\theta x_1 + \cos\theta x_2$ is a regular linear transformation. Hence find the inverse of this transformation.	4	L2
2.	a)	Using the power method, find the dominant eigen values and corresponding eigen vectors of the matrix $\begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$ starting with the initial value $[1 \quad 0 \quad 0]^T$. Carry out 5 iterations	6	L3
	b)	Reduce the quadratic form $8x^2 + 7y^2 + 3z^2 - 12xy - 8yz + 4zx$ to canonical form.	4	L2
		Unit – II		
3.	a)	With usual notation prove that $\tan\varphi = r\frac{d\theta}{dr}$	5	L3
	b)	Show that the radius of curvature at (a,0) on the curve $y^2 = \frac{a^2(a-x)}{x}$ is $\frac{a}{2}$.	5	L4
4.	a)	State and prove Lagrange's mean value theorem.	4	L3
	b)	Find the angle of intersection of the cardioids $r = a(1+\cos\theta), r = b(1-\cos\theta)$	4	L2
	c)	Find $\frac{ds}{dr}$ for the curve $r^n = a^n \cos n\theta$.	2	L2

BT* Bloom's Taxonomy, L* Level

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