Program: SE

Curriculum Scheme: Revised 2012

Examination: Second Year Semester IV

Course Code: ETS401 **Course Name: Applied Mathematics-IV**

Time: 1 hour Max. Marks: 50

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Note to the students:- All the Questions are compulsory and carry equal marks .

Laplace , inv laplace,matrices,lin alg, calculus

Q1.	The eigenvalues and eigenvectors of the following matrix are $$\begin{bmatrix} 2 & 1 & 0 \\ 0 & 2 & 1 \\ 0 & 0 & 2 \end{bmatrix}$$
Option A:	Eigen values :2,2,2 eigen vector: $\begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}$
Option B:	Eigen values :2,1,1 eigen vectors: $\begin{pmatrix} 2 \\ 0 \\ 0 \end{pmatrix}$, $\begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}$
Option C:	Eigen values :2,1,0 eigen vectors: $\begin{pmatrix} 2 \\ 0 \\ 0 \end{pmatrix}$, $\begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}$, $\begin{pmatrix} 1 \\ 1 \\ 0 \end{pmatrix}$
Option D:	Eigen values :1,1,0 eigen vectors: $\begin{pmatrix} 2 \\ 0 \\ 1 \end{pmatrix}$, $\begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}$, $\begin{pmatrix} 1 \\ 1 \\ 0 \end{pmatrix}$
Q2.	If $A = \begin{bmatrix} 1 & 8 \\ 2 & 1 \end{bmatrix}$ Find $$2A^3 - A^2 - 35A - 44I$$
Option A:	$A - 4I$
Option B:	$A + I$
Option C:	$5A + 3I$
Option D:	$15A + 7I$
Q3.	If $A = \begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix}$ & B= $\begin{bmatrix} 2 & 0 \\ 1/2 & 2 \end{bmatrix}$ then
Option A:	A and B both are not diagonalisable
Option B:	A and B both are diagonalisable
Option C:	A is diagonalizable but B is not diagonalisable
Option D:	A isnot diagonalizable but B is diagonalisable

Q4.	If $A = \begin{bmatrix} 1 & 0 & 0 \\ 1 & 0 & 1 \\ 0 & 1 & 0 \end{bmatrix}$ then A^{50} is
Option A:	$\begin{bmatrix} 1 & 0 & 0 \\ 25 & 0 & 0 \\ 25 & 0 & 1 \end{bmatrix}$
Option B:	$\begin{bmatrix} 1 & 0 & 0 \\ 25 & 1 & 0 \\ 25 & 0 & 0 \end{bmatrix}$
Option C:	$\begin{bmatrix} 1 & 0 & 0 \\ 25 & 1 & 0 \\ 25 & 0 & 1 \end{bmatrix}$
Option D:	$\begin{bmatrix} 0 & 0 & 0 \\ 25 & 1 & 0 \\ 25 & 0 & 1 \end{bmatrix}$
Q5.	Consider the following statements i)The eigenvalues of Hermitian matrix are real ii)Eigenvalues of skew Hermitian matrix are either purely imaginary or zero iii) Eigen values of unitary matrix are of unit modulus. Then
Option A:	statement i , ii are correct and iii is not correct
Option B:	statement i , is correct and ii, iii are not correct
Option C:	Statement i,ii,iii are not correct
Option D:	Statement i,ii,iii are correct statements.
Q6.	The sum and product of the eigen values of the matrix $\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$
Option A:	18,0
Option B:	0,18
Option C:	0,0
Option D:	9,9
Q7.	Eigen values of Skew Hermitian matrix are......
Option A:	all real
Option B:	are purely imaginary
Option C:	purely imaginary or zero
Option D:	Are of unit modulus
Q8.	Integration of the complex function $f(z) = \frac{z^2}{z^2-1}$,in the counterclockwise direction, around $\lvert z-1 \rvert = 1$,is
Option A:	πi
Option B:	$6\pi i$
Option C:	$8\pi i$

Option D:	0
Q9.	The residues of a function $f(z) = \frac{1}{(Z-4)(Z+1)^3}$ are
Option A:	0 and 1/125
Option B:	1/125 and -1/125
Option C:	1/125 and 0
Option D:	-1/125 and -1/125
Q10.	
Option A:	
Option B:	
Option C:	
Option D:	
Q11.	Evaluate $\int_c \frac{zdz}{(z-1)^2(z-2)} dz$ where $c: \lvert z-2 \rvert = 0.5$
Option A:	$4\pi i$
Option B:	$2\pi i$
Option C:	$i\pi$
Option D:	0
Q12.	Evaluate $\int_c \frac{COS\pi Z^2 dz}{(z^2-3Z+2)} dz$ where $c: \lvert z \rvert = 3$
Option A:	$8\pi i$
Option B:	$10\pi i$
Option C:	$4\pi i$
Option D:	0
Q13.	If $f(z)$ is analytic and $f'(z)$ is continuous at all points inside and on a simple closed curve C
Option A:	$\oint f(z)\, dz = 0$
Option B:	$\oint f(z)\, dz \neq 0$
Option C:	$\oint f(z)\, dz = 1$
Option D:	$\oint f(z)\, dz = 2\pi i$
Q14.	The singularities of $f(z) = \frac{(z+3)dz}{(z-1)(z-2)}$ are
Option A:	Z=0,2

Option B:	Z=2,-3
Option C:	Z=1,-3
Option D:	Z=1,2
Q15.	The residue of $f(z)=\frac{(1+e^z)}{sinz+zcosz}$ at pole z=0 is
Option A:	0
Option B:	$4\pi i$
Option C:	1
Option D:	-1
Q16.	The matrix A=$\begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$ is orthogonal to
Option A:	$\begin{bmatrix} -2 & 0 \\ 0 & 3 \end{bmatrix}$
Option B:	$\begin{bmatrix} 1 & -1 \\ 1 & 1 \end{bmatrix}$
Option C:	$\begin{bmatrix} -2 & 4 \\ 0 & 3 \end{bmatrix}$
Option D:	$\begin{bmatrix} -2 & 3 \\ 0 & 3 \end{bmatrix}$
Q17.	Find the inner product of u=$\begin{bmatrix} 2 & 6 \\ 9 & -4 \end{bmatrix}, v=\begin{bmatrix} -4 & 7 \\ 1 & 6 \end{bmatrix}$
Option A:	19
Option B:	5
Option C:	20
Option D:	29
Q18.	Which of the following is not the subspace of R^2
Option A:	{0}
Option B:	Lines through the origin
Option C:	W={$(x,y)\in R^2/x\geq 0, y\geq 0$}
Option D:	R^2 itself
Q19.	Construct an orthogonal basis of $R^2$by applying Gram Schmidt orthogonalization to $S=\{(3,1),(4,2)\}\ of\ R^2$
Option A:	$V_1=\{(3,3),\left(-\frac{1}{5},\frac{3}{5}\right)$
Option B:	$V_1=\{(3,1),\left(-\frac{1}{7},\frac{3}{9}\right)$
Option C:	$V_1=\{(5,2),\left(-\frac{1}{5},\frac{3}{5}\right)$
Option D:	$V_1=\{(3,1),\left(-\frac{1}{5},\frac{3}{5}\right)\}$
Q20.	Solve the Eulers Equation for $\int_{X1}^{X2}(x+y')y'dx$

Option A:	$y = -\frac{x^2}{5} + c_1 x + c_2$
Option B:	$y = -\frac{x^2}{4} + c_1 x^3 + c_2$
Option C:	$y = -\frac{x^2}{4} + c_1 x + c_2$
Option D:	$y = -\frac{x^3}{4} + c_1 x + c_2$
Q21.	IF u=(3,4,-2) V=(4,-2,1) W=(1,-3,4) then ||2u-3v+4w|| ^2 is
Option A:	81
Option B:	89
Option C:	11
Option D:	13
Q22.	Find a vector orthonormal to both u=(-6,4,2),v=(3,1,5)
Option A:	(1,-2,-1)
Option B:	(1,2,1)
Option C:	(1,2,-1)
Option D:	(-1,2,-1)
Q23.	What can you say about the vector ||u+v||=||u-v||
Option A:	They are orthogonal
Option B:	They are orthonormal
Option C:	They are not orthogonal
Option D:	They are orthogonal but not orthonormal
Q24.	The Extremal of $\int_{X1}^{X2} \frac{y'^2}{x^2} dx$
Option A:	y=c1(x)^3+c2
Option B:	y=c1(x)^2+c2x+c3
Option C:	y=c1x+c2
Option D:	y=c1(x)^4+c2
Q25.	If F does not contain y explicitly then Eulers equation reduces to
Option A:	$\frac{\partial F}{\partial y''} = c$
Option B:	$\frac{\partial F}{\partial y'} = c$
Option C:	$\frac{\partial F'}{\partial y''} = c$
Option D:	$\frac{\partial F}{\partial y'} - F = c$