

Program: BE Electronics Engineering

Curriculum Scheme: Revised 2012

Examination: Second Year Semester IV

Course Code: EXS401

Course Name: Applied Mathematics-IV

Time: 2 hour

Max. Marks: 80

Q.1 Multiple Choice Questions

Q1.	Is $S = \{(a,1,1) / a \text{ is real}\}$ is Subspace?
Option A:	Yes
Option B:	No
Option C:	Sometimes yes
Option D:	Sometimes no
Q2.	The eigen values for $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$ are
Option A:	1, 2, 3
Option B:	-1, -1, 5
Option C:	0, 3, 5
Option D:	1, 3, 6
Q3.	If λ is the eigen value of matrix A then $1/\lambda$ is eigen value of
Option A:	A^{-1}
Option B:	A^2
Option C:	$A-I$
Option D:	$ A $
Q4.	Evaluate $\int_A^B (2y + ix) dz$ along $y = x$ from A(0,0) to B(2,2)

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Option A:	1
Option B:	6
Option C:	-1
Option D:	None
Q5.	If (5, 8, 10) is a linear combination of (1, 2, 2) & (3, 4, 6) then
Option A:	$(5, 8, 10) = 2(1, 2, 2) + 1(3, 4, 6)$
Option B:	$(5, 8, 10) = 3(1, 2, 2) + 1(3, 4, 6)$
Option C:	$(5, 8, 10) = (1, 2, 2) + 5(3, 4, 6)$
Option D:	$(5, 8, 10) = 1(1, 2, 2) + 10(3, 4, 6)$
Q6.	Evaluate $\int_0^{1+i} (x^2 - i y) dz$ along $y = x$
Option A:	1
Option B:	6
Option C:	-1
Option D:	None
Q7.	Check whether the vectors $u=(-2, 3, 4)$ and $v=(3, -2, 3)$ are orthogonal?
Option A:	Yes
Option B:	No
Option C:	Sometimes yes
Option D:	Sometimes no

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Q8.	Evaluate $\int_C \frac{dz}{z^3(z+4)}$ where C is the circle $ z =2$
Option A:	0
Option B:	$\pi/32$
Option C:	1
Option D:	4
Q9.	If a square matrix A is non derogatory then it's eigen values are
Option A:	Same
Option B:	Distinct
Option C:	Inverse
Option D:	Transpose
Q10.	Check whether the Cauchy-Schwartz inequality is verified or not for (2,3,0) and (4,2,1)
Option A:	Yes
Option B:	No
Option C:	Sometimes yes
Option D:	Sometimes no
Q11.	Which trial equation Raleigh-Ritz method assume?

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Option A:	$\bar{y}(x) = a + bx + cx^2$
Option B:	$\bar{y}(x) = ax + bx^2$
Option C:	$\bar{y}(x) = a + bx$
Option D:	$\bar{y}(x) = a + bx^2$
Q12.	Find the poles of the function $f(z) = \frac{z-1}{z^2+2z+5}$
Option A:	-1-2i & -1+2i
Option B:	-1-2i
Option C:	-2i
Option D:	-1+2i
Option D:	
Q13.	What is the residue of $f(z) = \frac{3z^2+z}{z^2-1}$ at $z=1$
Option A:	1
Option B:	3
Option C:	2
Option D:	0
Q14.	Verify whether the Pythagorean theorem is applicable for $u = (3,4)$ and $v = (-4, 3)$
Option A:	Yes

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Option B:	No
Option C:	Sometimes yes
Option D:	Sometimes no
Q15.	If 1, 2 & 3 are eigen values of matrix A then eigen values of matrix A^3 are
Option A:	2, 3 & 9
Option B:	1, 4 & 9
Option C:	2, 3 & 2
Option D:	0, 3 & 9
Q16.	If the vectors (2, -1, 3), (4, 1, 2) and (8, -1, 8) determinant is not zero then these vectors
Option A:	Span vector space R^3
Option B:	Do not Span vector space R^3
Option C:	Span I
Option D:	Do not Span I
Q17.	Find the extremals of $\int_0^1 (xy + y^2 - 2y^2 y') dx$
Option A:	$y = -x / 2$
Option B:	$y = x$
Option C:	$y = 3x$
Option D:	$y = 0$

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Q18.	Find the extremals of $\int_{x_1}^{x_2} \frac{y'^2}{x^2} dx$
Option A:	$y = c_1 x^3 + c_2$
Option B:	$y = c_1 x + c_2$
Option C:	$y = c_1 x^5 + c_2$
Option D:	$y = c_1 x^6 + c_2$
Q19.	Every square matrix satisfies its own
Option A:	Transpose equation
Option B:	Identical equation
Option C:	Characteristic equation
Option D:	Linear equation
Q20.	If $f(z)$ is analytic inside and on a closed curve C of a simply connected region R and if z_0 is any point within C then $f(z_0)$ is
Option A:	$\frac{1}{2\pi i} \int_C \frac{f(z)}{z - z_0} dz$
Option B:	$\frac{1}{2\pi i}$
Option C:	$\int_C \frac{f(z)}{z - z_0} dz$

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Option D:	0
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Q.2 Attempt any 2 [20 M]

Q.2 a. Check whether the set of all pairs of real numbers of the form $(1, x)$ with operations $(1, y) + (1, y') = (1, y + y')$ and $k(1, y) = (1, ky)$ is a vector space. [10 M]

Q.2b. Using Rayleigh-Ritz method, Solve the boundary value problem

$$I = \int_0^1 (2xy + y^2 - y'^2) dx \quad 0 < x < 1, \text{ given } y(0) = y(1) = 0 \quad [10 M]$$

Q.2 c. Find the singular value decomposition of $\begin{bmatrix} 4 & 4 \\ -3 & 3 \end{bmatrix}$ [10 M]

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Q.3 Attempt any 2 [20 M]

Q.3 a. Reduce the following quadratic form $6x^2 + 3y^2 + 14z^2 + 4xy + 18xz + yz$ to diagonal form

through congruent transformation. [10 M]

Q.3.b. Find the Laurent series which represents the function

$$f(z) = \frac{2}{(z-1)(z-2)} \quad \text{When i) } |z| < 1 \quad \text{ii) } 1 < |z| < 2 \quad \text{iii) } |z| > 2 \quad [10M]$$

Q.3.c. Evaluate $\int_0^{2\pi} \frac{\cos 2\theta}{5 + 4\cos \theta} d\theta$ [10M]