SET A

Department of Mathematics and Natural Sciences

Quiz 1

Semester: Summer 2015

Course Title: Linear Algebra and Fourier Analysis (MATH IV)

Course No.: MAT216

Section: 06

Student Name	:		Student ID	:	
Time	:	40 min	Date	:	May 25, 2015
Total marks	:	25	Marks Obtained	:	

Answer the following

1. Define *system of linear equations*. Solve the following system by *Gauss-Jordan elimination* process. [10]

$$x_1 - x_2 + 2x_3 = 6$$
$$-x_1 + 2x_2 + 3x_3 = 5$$
$$3x_1 - 7x_2 + 4x_3 = 4$$

2. Define *consistent* and *inconsistent* systems. Determine the values of parameter λ, such that the following system has: (i) no solution, (ii) unique solution, (iii) infinitely many solutions. [10]

$$x + y - z = 1$$
$$2x + 3y + \lambda z = 3$$
$$x + \lambda y + 3z = 2$$

3. Define *transpose* and *symmetric* matrix with examples. If [5]

$$A = \begin{bmatrix} 2 & 5 & 3 \\ 3 & 1 & 2 \\ 1 & 2 & 1 \end{bmatrix}$$

then verify that $(A^2)^T = (A^T)^2$.

SET B

Department of Mathematics and Natural Sciences

Quiz 1

Semester: Summer 2015

Course Title: Linear Algebra and Fourier Analysis (MATH IV)

Course No.: MAT216

Section: 06

Student Name	:		Student ID	:	
Time	:	40 min	Date	:	May 25, 2015
Total marks	:	25	Marks Obtained	:	

Answer the following

1. Define *system of linear equations*. Solve the following system by *Gauss-Jordan elimination* process. [10]

$$x_1 + x_2 + 2x_3 = 5$$
$$-x_1 - 2x_2 + 3x_3 = 12$$
$$3x_1 - 7x_2 + 4x_3 = 29$$

2. Define *consistent* and *inconsistent* systems. Determine the values of parameter k, such that the following system has (i) no solution, (ii) unique solution, (iii) infinitely many solutions. [10]

$$x + y + kz = 2$$
$$3x + 4y + 2z = k$$
$$2x + 3y - z = 1$$

3. Define *transpose* and *symmetric* matrix. If [5]

$$A = \begin{bmatrix} 2 & 5 & 3 \\ 3 & 1 & 2 \\ 1 & 2 & 1 \end{bmatrix}, \qquad B = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 2 & 3 \\ 1 & 4 & 9 \end{bmatrix}$$

then verify the $(AB)^T = B^T A^T$

SET A

Department of Mathematics and Natural Sciences

Quiz 2

Semester: Summer 2015

Course Title: Linear Algebra and Fourier Analysis (MATH IV)

Course No.: MAT216

Section: 06

Student Name	:	Student ID	:
Time	: 40 min	Date	: June 15, 2015
Total marks	: 25	Marks Obtained	:

Answer the following

1. Define *inverse* matrix. Find A^{-1} for the following matrix [9]

$$A = \begin{bmatrix} 1 & -1 & 0 \\ 1 & 0 & -1 \\ -6 & 2 & 3 \end{bmatrix}.$$

2. Define *vector space*. Show that the set $M_{2\times 2}$ of all 2×2 matrices is a vector space under the matrix addition and scalar multiplication. [9]

3. Write $w = (1, 1, 1)$ as a linear combination of vectors in the set S. [7]

$$S = \{(1, 2, 3), (0, 1, 2), (-1, 0, 1)\}.$$

Are the vectors in S linearly independent?

SET B

Department of Mathematics and Natural Sciences

Quiz 2

Semester: Summer 2015

Course Title: Linear Algebra and Fourier Analysis (MATH IV)

Course No.: MAT216

Section: 06

Student Name	:		Student ID	:	
Time	:	40 min	Date	:	June 15, 2015
Total marks	:	25	Marks Obtained	:	

Answer the following

1. Define *inverse* matrix. Find A^{-1} for the following matrix [9]

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 1 & 3 & 3 \\ 2 & 4 & 3 \end{bmatrix}.$$

2. Define *vector space* and *subspace*. Show that the set W of all 2×2 symmetric matrices is a subspace of the vector space $M_{2\times 2}$ under the matrix addition and scalar multiplication. [9]

3. Write $w = (1, 1, 1)$ as a linear combination of vectors in the set S. [7]

$$S = \{(1, 2, 3), (0, 1, 2), (-2, 0, 1)\}.$$

Are the vectors in S linearly independent?

SET A

Department of Mathematics and Natural Sciences

Quiz 3

Semester: Summer 2015

Course Title: Linear Algebra and Fourier Analysis (MATH IV)

Course No.: MAT216

Section: 06

Student Name	:	Student ID	:
Time	: 40 min	Date	: July 13, 2015
Total marks	: 25	Marks Obtained	:

Answer the following

1. Define *eigenvalue* and *eigenvector*. Find the eigenvalues and corresponding eigenvectors of the matrix A. Also find a matrix P that *diagonalizes* A. [15]

$$A = \begin{bmatrix} 0 & 0 & -2 \\ 1 & 2 & 1 \\ 1 & 0 & 3 \end{bmatrix}$$

2. Evaluate the *iterated* integrals [5]

$$\int_{2}^{4}\int_{-1}^{3}(x^2 + xy)\,dxdy.$$

3. Evaluate the *double* integral over the region R (any one): [5]

i) $\iint\limits_{R} xe^y\,dA$; R is the region bounded by $y = 1,\quad y = 2,\quad x = 0,\quad x = 3.$

ii) $\iint\limits_{R} xy^2\,dA$; R is the region bounded by $x^2 + y^2 = 1.$

BRAC UNIVERSITY

Inspiring Excellence

SET B

Department of Mathematics and Natural Sciences

Quiz 3

Semester: Summer 2015

Course Title: Linear Algebra and Fourier Analysis (MATH IV)

Course No.: MAT216

Section: 06

Student Name	:		Student ID	:	
Time	:	40 min	Date	:	July 13, 2015
Total marks	:	25	Marks Obtained	:	

Answer the following

1. Define *eigenvalue* and *eigenvector*. Find the eigenvalues and corresponding eigenvectors of the matrix A. Also find a matrix P that *diagonalizes* A. [15]

$$A = \begin{bmatrix} 1 & 3 & 0 \\ 3 & 1 & 0 \\ 0 & 0 & -2 \end{bmatrix}$$

2. Evaluate the *iterated* integrals [5]

$$\int_{-1}^{3}\int_{2}^{3} (xy + y^2)\, dydx$$

3. Evaluate the *double* integral over the region R (any one): [5]

i) $\iint_R ye^x\, dA$; R is the region bounded by

$y = 0, \quad y = 3, \quad x = 0, \quad x = 2.$

ii) $\iint_R xy^2\, dA$; R is the region bounded by

$y^2 = x, \quad y = x^2.$

SET A

Department of Mathematics and Natural Sciences

Quiz 4

Semester: Summer 2015

Course Title: Linear Algebra and Fourier Analysis (MATH IV)

Course No.: MAT216

Section: 06

Student Name	:		Student ID	:	
Time	:	40 min	Date	:	Aug 3, 2015
Total marks	:	25	Marks Obtained	:	

Answer the following

1. Evaluate [9]

$$\iint_R \frac{x-y}{x+y}\, dA,$$

where R is the region enclosed by $x-y=1, x-y=2, x+y=1$, and $x+y=3$.

2. Evaluate [8]

$$\int_C \vec{F}\cdot d\vec{r}$$

where, $\vec{F}=(3x^2-6yz)\hat{\imath}+(2y+3xz)\hat{\jmath}+(1-4xyz^2)\hat{k}$ and the curve C is a parabola from (0,0,0) to (1,1,1) parametrized by $x=t,\ y=t^2,\ z=t^3$.

3. Use Green's theorem to evaluate the line integral [8]

$$\oint_C (e^x+y^2)dx+(e^y+x^2)dy,$$

where C enclosed the region bounded by $y=x^2$ and $y=x$ oriented counterclockwise.

SET B

Department of Mathematics and Natural Sciences

Quiz 4

Semester: Summer 2015

Course Title: Linear Algebra and Fourier Analysis (MATH IV)

Course No.: MAT216

Section: 06

Student Name	:	Student ID	:
Time	: 40 min	Date	: Aug 3, 2015
Total marks	: 25	Marks Obtained	:

Answer the following

1. Evaluate [9]

$$\iint_R \frac{e^{x-y}}{x+y}\, dA,$$

where R is the region enclosed by $y = x, y = x + 5, y = 2 - x$, and $y = 4 - x$.

2. Evaluate [8]

$$\int_C \vec{F} \cdot d\vec{r},$$

where, $\vec{F} = (2y + 3xz)\hat{\imath} + (1 - 4xyz^2)\hat{\jmath} + (3x^2 - 6yz)\hat{k}$ and C is a line segment from $(0,0,0)$ to $(1,1,1)$.

3. Use Green's theorem to evaluate the line integral [8]

$$\oint_C (x + y^2)dx + (3x + 2xy)dy,$$

where C is the circle $x^2 + y^2 = 4$ oriented counterclockwise.
