BITS, PILANI-DUBAI
INTERNATIONAL ACADEMIC CITY, DUBAI

FIRST YEAR - SEMESTER-II (2008-09)

MATHEMATICS-II (MATH C192)

COMPREHENSIVE EXAMINATION (CLOSED BOOK)

Date: 01.06.2009 | **Max. Marks: 120**
Time: 3 hours | **Weightage: 40 %**

Answer all the questions.

Answer Part A, Part B, Part C and Part D in separate Answer Books.

PART A

1 a) Check for the consistency of the following system of linear equations and solve it.

$$\begin{aligned} x_1 + 2x_2 - 3x_4 &= 2 \\ x_1 + 2x_2 + x_3 + 3x_4 &= 3 \\ 2x_1 + 4x_2 - 6x_4 &= 4 \\ 3x_1 + 5x_2 + x_3 - 4x_4 &= 4 \end{aligned}$$ [8]

b) Let R^2 be the set of all ordered pairs of positive real numbers in which the addition of vectors '$\oplus$' and scalar multiplication '*' are defined as
$(x_1, y_1) \oplus (x_2, y_2) = (x_1 + x_2, y_1 + y_2)$ and $c * (x, y) = (3cx, y)$, $c > 0$. Check whether the closure and associative properties are true in R^2. Is $(R^2, \oplus, *)$ a vector space? Justify. [7]

2 a) Let $S = \{t^3 + t^2 - 2t + 1,\ t^2 + 1,\ t^3 - 2t,\ 2t^3 + 3t^2 - 4t + 3\}$ be a subset of P_3. Find a basis from S for the subspace $W = \textit{Span}\ S$ and also find $\dim(W)$. [8]

b) Let $L : R^3 \to R^3$ be defined by $L(x, y, z) = (x + 2y + z, 2x - y, 2y + z)$. Let S be the natural basis for R^3 and $T = \{(1,0,1), (0,1,1), (0,0,1)\}$ be any other basis for R^3. Find the matrix of L with respect to (i) S & T (ii) T & S [7]

PART B

3. a) Prove that the function $u(x, y) = x^3 - 3xy^2$ is harmonic and find its harmonic conjugate $v(x, y)$. [8]

b) Test whether the complex function $f(z) = e^{-y} \sin x - ie^{-y} \cos x$ is entire. [7]

4. a) Find the principal value of $(1 - i)^{4i}$. [5]

b) If C is the upper half of the circle $|z| = 4$, then without integrating find an upper bound for

$$\left| \int_C \frac{(z+1)dz}{(z^3-2)} \right|$$ [10]

PART C

5 a) Find the characteristic equation and eigenvalues of the following matrix. Also find the eigenvector corresponding to any one eigenvalue.

$$\begin{pmatrix} 2 & 2 & 3 \\ 1 & 2 & 1 \\ 2 & -2 & 1 \end{pmatrix}$$ [10]

b) Evaluate $\int_C \frac{dz}{(z^2+2z+2)}$ where C is given by $|z| = 1$. [5]

6 a) Apply Cauchy's integral formula to evaluate $\int_C \frac{\cos(z)\, dz}{z(z^2+8)}$ where C denote the positively oriented boundary of the square whose sides lie along the lines $x = \pm 2$, $y = \pm 2$. [8]

(b) Expand $f(z) = \frac{z}{(z+1)(z-3)}$ as a Laurent's series valid in the region $1 < |z| < 3$.

[7]

PART D

7. Let C be the circle $|z-3| = 2$, described in the positive sense. Evaluate the following integral:

$$\int_C \frac{(z^2+2)\, dz}{z^2-5z+6}$$ [10]

8. Find the residues for the following functions:

(a) $\frac{e^z}{(z^2+4)^2}$ at the pole in the upper plane (b) $z\, e^{\left(\frac{1}{z-2}\right)}$

Also indicate the nature of the poles. [5+5]

9. Evaluate $\int_{-\infty}^{\infty} \frac{dx}{(x^2+1)(x^2+16)}$ [10]

All the Best

BITS-PILANI, DUBAI
International Academic City, Dubai
First Year-Semester-II (2008-09)

MATHEMATICS-II (MATH C192)
Test-II (Open Book)

Time: 50 minutes **Max. Marks: 60** **Weightage: 20%** **26.04.2009**

Note 1. ***Only the prescribed text books and handwritten class notes are allowed***
2. Answer all the questions sequentially.

1. Find the square roots of $-1-i\sqrt{3}$ and represent them geometrically. (5marks)

2. Let $L: R^3 \to R^3$ be defined by $L(x,y,z) = (x-y+z,\ 2x+3y-\frac{z}{2},\ x+y-2z)$
Let S be the natural basis and T = { (1, 1, 0) , (1, 2, 3), (-1, 0, 1) } be another basis for R^3. Find the matrix of L with respect to S and T. (10 marks)

3. Find bases for the range and kernel of the linear transformation $L: V_4 \to V_4$ defined by $L(x_1,x_2,x_3,x_4) = (3x_1+2x_2, x_1-x_3, x_1-x_4, -x_3+x_4)$ and check that $\dim(V_4) = rank(L) + nullity(L)$. (8 marks)

4. Verify whether the linear transformation $T(x_1,x_2,x_3,x_4) = (x_1-x_4, x_2+x_3, x_3-x_4)$ defined from R^4 to R^3 is one to one and onto or not. (7 marks)

5. Find the characteristic polynomial and all the eigenvalues of the matrix
$$A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}.$$
Also find an eigenvector corresponding to the largest eigenvalue.
(10 marks)

6. Prove that the following limit does not exist:
$$\lim_{z\to 0} \frac{\mathrm{Re}(z^2)}{|z|^2}.$$
(5 marks)

7. Show that $f'(0)$ does not exist if $f(z) = \sqrt{|x\,y|}$, $z \neq 0$ and $f(0) = 0$.
(8 marks)

8. Does the function $f(z) = (x^2 - y^2 + 3x) - i\,(2xy + 3y)$ have a derivative everywhere in the complex plane? Justify. (7 marks)

BITS-PILANI, DUBAI
International Academic City, Dubai
First Year-Semester-II (2008-09)

MATHEMATICS-II (MATH C192)
Test-I (Closed Book)

TIME: 50 Minutes	Marks: 75	Weightage: 25%	15.03.2009

Answer all the questions sequentially.

1. For what values of a, b the linear system
$$x+y+3z=2,\ x+3y+2z=4,\ x+y+(a^2-1)z=b$$
has (i) no solution (ii) unique solution (iii) infinitely many solutions (10)

2. Find the inverse of the following matrix using Gauss Jordan procedure:
$$\begin{pmatrix} 1 & 3 & -2 \\ 0 & 2 & 4 \\ 0 & 0 & 3 \end{pmatrix}$$
(10)

3. Find a basis for the subspace $W = \text{span } S$ of R^4 where
$S = \{(1,0,0,-1), (0,1,2,1), (1,0,1,-1), (1,1,-6,-3), (-1,-5,1,0)\}$.
What is $\dim W$? (10)

4. Check whether the polynomials
$t^3+2t+1,\ t^2-t+2,\ t^3+2,\ -t^3+t^2-5t+2$ are LI? (10)

5. Find a basis and the dimension of the solution space of the system
$x_1+3x_2-x_3+x_4=0,\ 2x_1+2x_2-x_3+x_4=0,\ x_1+2x_2-3x_3=0$ (8)

6. Let $S=\{(1,2,-1), (1,9,-1), (-3,8,3)\}$ and let $V = span\,S$. Find a basis for V. What is $\dim V$? (7)

6. Is S a subspace of the indicated vector space? Justify.
$$S=\{(x,y,z,w)/z=x+2y \ and \ w=x-3y\},\ V=R^4$$
(6)

7. Does $p(t) \in span\,S$ if $S=\{t^2-t,\ t^2-2t+1, -t^2+1\}$ and
$p(t)=2t^2-t-1$ (7)

8. Let V be the set of real numbers. Define $\oplus$ by $u \oplus v = 3u+5v-6$ and $\otimes$ by $c \otimes u = c^2 u$. Is V a vector space? Justify. (7)

All the Best!

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BITS, PILANI, DUBAI
MATHEMATICS-II (MATH C192)
QUIZ-3 (SECTION-8)

TIME: 20 MINUTES **MAX. MARKS: 15** **13.05.2009**

1. Find the principal value of $(-3i)^{-1+i}$

2. Find the Laurent's series of $f(z) = \dfrac{z}{(z+4)(z-2)}$ **when z lies inside the circle** $|z| = 2$

3. Evaluate $\displaystyle\int_C \frac{\sin z}{z^2 + 4z + 4}\, dz$ **where C is given by** $|z+2| = 1$

Time: 20 minutes

BITS, PILANI, DUBAI
MATHEMATICS-II (MATH C192)
QUIZ-2 (SECTION-8)
MAX. MARKS: 15 26.03.2009

1. Is $L(x, y) = (3x + 2y, -x + y + 6)$ a LT? Justify. NO

2. Check whether $L(at + b) = (a + b)t^2 + (a - 6b)$ is a LT? Justify. YES

3. Find Ker L if $L: R^3 \to R^2$ given by $L(x, y, z) = (3x - 7y, y + 3z)$ $\text{Ker} L = \text{span}\{(7, 3, -1)\}$

4. Is the LT $L(a_1, a_2) = (a_1 + 3a_2, -a_2)$ onto? Justify. YES, $\text{range} L = \mathbb{R}^2$

5. Find the range of
$$L(at + b) = (3a + b)t + (5a - b).$$
range L $= \text{span}\{3t + 5, t - 1\}$

BITS, PILANI, DUBAI
MATHEMATICS-II (MATH C192)
QUIZ-2 (SECTION-8)
MAX. MARKS: 15 **26.03.2009**

Time: 20 minutes

1. Is $L(x, y) = (x + 2y, x - y, 1)$ is a LT? Justify.

2. Check $L(at^2 + bt + c) = (2a - b)t + (b + 4c)$ is a LT?

3. Find the null space of the LT $L: \mathbb{R}^2 \to \mathbb{R}^3$ by $L(x, y) = (2x - y, 3x + 4y, x + y)$

4. Is the LT $L(a_1, a_2, a_3) = (0, a_2, a_1 - a_3)$ is one-one? Justify.

5. What is the range of the LT $L(x) = (x, 2x, -4x)$.

BITS, PILANI, DUBAI
MATHEMATICS-II (MATH C192)
QUIZ-2 (SECTION-8)
MAX. MARKS: 15 **26.03.2009**

Time: 20 minutes

1. Is $L(x, y) = (3x + 2y, -x + y + 6)$ a LT? Justify.

2. Check whether $L(at + b) = (a + b)t^2 + (a - 6b)$ is a LT? Justify.

3. Find Ker L if $L: \mathbb{R}^3 \to \mathbb{R}^2$ given by $L(x, y, z) = (3x - 7y, y + 3z)$

4. Is the LT $L(a_1, a_2) = (a_1 + 3a_2, -a_2)$ onto? Justify.

5. Find the range of $L(at + b) = (3a + b)t + (5a - b)$.

BITS, PILANI – DUBAI

MATH C192 – Mathematics-II

A

QUIZ-I SECTION – 8

04.03.2009

Time : 20 min

5×3 = 15 marks.

(1) Find the rank of $\begin{bmatrix} 0 & 0 & 1 & 2 \\ 2 & 3 & 0 & -2 \\ 3 & 3 & 6 & -9 \end{bmatrix}$

(2) Find B such that $AB = I$ if $A = \begin{bmatrix} 2 & 3 \\ 5 & 6 \end{bmatrix}$

(3) Is $(2, -1, 8) \in [S]$ where $S = \{(1, 2, 1), (-1, 1, 1), (4, 2, -5)\}$? Justify.

(4) Is $S = \{(a, b, c) \mid a, b, c$ are real and $b = 2a+1\}$ a subspace of R^3? Justify.

(5) Is $S = \{t^2 - 4, 5t^2 - 5t + 6, t + 2\}$ LI? Justify.

– won –

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04.03.09

B

MATH C192 – Mathematics-II

Time: 20 min.

QUIZ – I SECTION – 8

5×3 = 15 marks.

(1) Solve $x - 2y = 4$, $y + 3z = 1$, $x - y + z = 3$.

(2) Find A if $A^{-1} = \begin{bmatrix} 1 & 2 \\ -3 & 4 \end{bmatrix}$

(3) Is $x + 2 \in [S]$ if $S = \{x^2 + 5, x - 1, x + 2\}$? Justify.

(4) Is $S = \{(a, b, c) \mid a = 3b$ or $b + c = 0\}$ a subspace of R^3? Justify.

(5) Is $S = \{(2, 2, 3), (-1, -2, 1), (0, 1, 0)\}$ LI? Justify.

– won –

BITS, PILANI – DUBAI

DUBAI INTERNATIONAL ACADEMIC CITY.

1 YEAR – II SEMESTER 2008-2009

QUIZ-III(CB)

Course : Mathematics - II	Section - VI	Course No:MATH C192
Max.Marks:15	Weightage:5%	Time:15 Mins. **Dt.29-4-09**

Name: ID. No.

1. The largest eigen value of the matrix $\begin{bmatrix} 2 & 1 & 0 \\ 1 & 2 & 1 \\ 0 & 1 & 2 \end{bmatrix}$ is ________________

2. If $L : R^3 \to R^3$ defined by $L(x_1, x_2, x_3) = (x_1 - x_2 + x_3, x_1 + x_2, x_2 - x_3)$, then the coordinates of (1,2,-1) with respect to the basis $S = \{(1,0,1), (0,1,-1), (0,0,1)\}$ are _________.

3. Find the inverse of $\sqrt{2} + i\sqrt{3}$

4. Imaginary component of the function $f(z) = (z + 2i)(-2z - 3)$ is ___________

5. The Principal Value of i^{2i} is ________________

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1 YEAR – II SEMESTER 2008-2009

QUIZ-1I (CB)

Course : Mathematics - II	Section - VI	Course No:MATH C192
Max.Marks:15	Weightage:5%	Time:15 Mins. **Dt.26-3-09**

Name: ID. No.

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1. The basis for the solutions space of the homogeneous system $x_2 + 2x_3 = 0;\ x_1 + 2x_2 + 3x_3 = 0;\ x_1 + 3x_2 + 5x_3 = 0$ is ________________

2. Coordinate vector of $(1,-1,2)$ with respect to the ordered basis $S = \{(-1,1,0),(0,1,-1),(1,0,1)\}$ is________________

3. If $L : P_2 \to P_3$ is a linear transformation for which $L(1) = 1, L(t) = t^3, L(t^2) = t^2 + t$ then $L(2t^2 - 5t + 3) =$ ________________

4. If $L : R^2 \to R^2$ is defined as $L(x, y) = (0, y)$, then ker L =________________

5. Let $L : R^3 \to R^2$ be defined by $L(x, y, z) = (x - y, x + 2y)$ is

a)	one-to-one	b)	onto
c)	one-to-one & onto	d)	None

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1 YEAR – II SEMESTER 2008-2009

QUIZ-1 (CB)

Course : Mathematics - II   Section - VI   Course No:MATH C192

Max.Marks:15   Weightage:5%   Time:15 Mins. **Dt.4-3-09**

Name: ID. No.

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1. The row reduced echelon form of the matrix

$$A = \begin{bmatrix} 1 & 2 & 3 & -9 \\ 2 & -1 & 1 & -8 \\ 3 & 0 & -1 & -3 \end{bmatrix} \quad \text{is} \_\_\_\_\_\_\_\_\_\_\_\_.$$

2. Let V be the set of all positive real ordered pairs, with usual addition of vectors '+' and scalar multiplication '*' is not a vector space. Give one property, which it fails to satisfy (with details).

3. Express the vector $v = (3,7)$ as a linear combination of the vectors in the basis S= $\{ v_1 = (1,2), v_2 = (0,1) \}$.

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DUBAI INTERNATIONAL ACADEMIC CITY

1 YEAR – II SEMESTER 2008-2009

QUIZ-1I (CB)

Course : Mathematics - II　　Section - V　　Course No:MATH C192

Max.Marks:15　　Weightage:5%　　Time:15 Mins. **Dt.29-3-09**

Name:　　ID. No.

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1. The basis and dimension of the null space of homogeneous system of equations
$x_1 - x_2 + x_3 - x_4 = 0, 2x_1 + x_2 - x_3 + x_4 = 0$ is ______________.

2. The coordinate vector of $5 - 3t - 2t^2$ relative to the ordered basis $\{t^2 + t + 1, t + 1, 1\}$ is____________________________

3. If $L: R^3 \to R^3$ is a linear transformation for which
$L(1,-1,0) = (3,0,1), L(0,1,-1) = (1,0,3), L(-1,1,1) = (0,1,3)$ then
$L(-a, 2b, c)$ = __________________.

4. If $L: R^3 \to R^3$ is a linear transformation defined as
$L(x, y, z) = (x + 2y, 2x + y, z)$ then a basis for the Ker L is _____________.

5. If $L: R^2 \to R^3$ is a linear transformation defined as $L(x, y) = (x, 2x + y, y)$ then L is

a) Onto　　b) One to one

c) One to one & onto　　d) None

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DUBAI NTERNATIONAL ACADEMIC CITY

1 YEAR – II SEMESTER 2008-2009

QUIZ-1 (CB)

Course : Mathematics - II	Section - V	Course No:MATH C192
Max.Marks:15	Weightage:5%	Time:15 Mins. Dt.5.**3.09**

Name: ID. No.

1. The homogeneous system of equations $\begin{aligned} 2x+y-z&=0 \\ x-2y-3z&=0 \\ -3x-y+az&=0 \end{aligned}$ has a non trivial solution if $a =$ ______________.

2. Express $v=(-1,4,2,2)$ as a linear combination of the vectors in S={ $v_1=(1,0,0,1), v_2=(1,-1,0,0), v_3=(0,1,2,1)$ }

3. Let V be the set of all positive real numbers. The vector addition '+' and scalar multiplication '*' are defined as $u+v = u + v - uv$; $c*u = u^c$ Check the associative property of vector addition.

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DUBAI NTERNATIONAL ACADEMIC CITY

1 YEAR – II SEMESTER 2008-2009

QUIZ-1 (CB)

Course : Mathematics - II Section - V Course No:MATH C192

Max.Marks:15 Weightage:5% Time:15 Mins. **Dt.5-3-09**

Name: ID. No.

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1. The homogeneous system of equations $\begin{aligned} 2x+y-z&=0 \\ x-2y-3z&=0 \\ -3x-y+(a^2-2)z&=0 \end{aligned}$ has only trivial solution if $a =$ ______________.

2. Let V be the set of all positive real ordered pairs, with addition of vectors '+' and scalar multiplication '*' defined as

   $(x_1, y_1) + (x_2, y_2) = (x_1 x_2, y_1 y_2)$; $c*(x, y) = (cx, cy)$
   is **not** a vector space.
   Give one property, which it fails to satisfy (with details).

3. Express the vector $v = (4,6,8,6)$ as a linear combination of the vectors $v_1 = (1,1,2,1), v_2 = (1,0,0,2), v_3 = (0,3,2,1)$.

quiz 3 sec 4

BITS, PILANI, DUBAI
MATHEMATICS-II (MATH C192)
QUIZ-3 (SECTION-4)

TIME: 20 MINUTES MAX. MARKS: 15 12.05.2009

1. Find the principal value of $(1+i)^{2i}$

2. Evaluate $\int_C (z^2+4)dz$ where C is the straight line joining 1 and 1+i.

3. Evaluate $\int_C \frac{e^{2z}}{z^2+9} dz$ where C is given by $|z-3i|=1$

q.p

A

BITS, PILANI, DUBAI
MATHEMATICS-II (MATH C192)
QUIZ-2 (SECTION-4)

TIME: 20 MINUTES MAX. MARKS: 15 29.03.2009

1. Check whether $L: R^3 \to R^3$ by $L(x,y,z) = (4,2,-7)$ is a LT? NO

2. Find the coordinate vector of $v = (6,-2,1)$ w.r.to the basis $S = \{(1,0,0), (0,2,4), (0,0,5)\}$ $[v]_S = \begin{bmatrix} 6 \\ -1 \\ 1 \end{bmatrix}$

3. Find the Kernel of $L: \mathbb{R}^2 \to \mathbb{R}^3$ by $L(x,y) = (x-2y, 3x+4y, x)$ $\text{Ker } L = \{(0,0)\}$

4. Find the range of $L: P_2 \to P_3$ by $L(at^2+bt+c) = (2a+b)t - (3a+c)$ range L = span$\{2t-3, 1\}$

5. Find $L: \mathbb{R}^2 \to \mathbb{R}^2$ if $L(1,2) = (4,-1)$, $L(0,1) = (2,3)$ given that L is a LT. $L(x,y) = (2y, 3y-7x)$

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BITS, PILANI, DUBAI
MATHEMATICS-II (MATH C192)
QUIZ-2 (SECTION-4)

TIME: 20 MINUTES **MAX. MARKS: 15** B **29.03.2009**

1. Check whether $L : \mathbb{R}^3 \to \mathbb{R}^3$ by $L(x, y, z) = (0, 0, 0)$ is a LT? YES

2. Find the coordinate vector of $2t-4$ w.r.to the basis $S = \{t-1, t+1\}$. $[v]_S = \begin{bmatrix} 3 \\ -1 \end{bmatrix}$

3. Find the null space of $L : \mathbb{R}^3 \to \mathbb{R}^2$ by $L(x, y, z) = (2x+3y, x-z)$
Ker L = Span $\{(1, -2/3, 1)\}$

4. Find the range of $L : P_3 \to P_2$ by $L(at^3+bt^2+ct+d) = (a-b)t^2 + (2a-c)t$.
range L = Span $\{t^2+2t, t\}$.

5. Find the LT $L : \mathbb{R}^2 \to \mathbb{R}^2$ by $L(2,3) = (1,-1)$, $L(0,2) = (1,2)$.

- END -

$L(x, y) = \left(\frac{2y-x}{4}, y-2x\right)$

BITS, PILANI, DUBAI
MATHEMATICS-II (MATH C192)
QUIZ-2 (SECTION-4) A

TIME: 20 MINUTES **MAX. MARKS: 15** **29.03.2009**

1. Check whether $L : \mathbb{R}^3 \to \mathbb{R}^3$ by $L(x, y, z) = (4, 2, -7$ is a LT?
2. Find the coordinate vector of $v = (6, -2, 1)$ w.r.to the basis $S = \{(1,0,0), (0,2,4), (0,0,5)\}$
3. Find the Kernel of $L : \mathbb{R}^2 \to \mathbb{R}^3$ by
$$L(x, y) = (x - 2y, \ 3x + 4y, \ x)$$
4. Find the range of $L : P_2 \to P_3$ by
$$L(at^2 + bt + c) = (2a+b)t - (3a+c)$$
5. Find $L : \mathbb{R}^2 \to \mathbb{R}^2$ if $L(1, 2) = (4, -1)$, $L(0, 1) = (2, 3)$ given that L is a LT.

BITS, PILANI, DUBAI
MATHEMATICS-II (MATH C192)
QUIZ-2 (SECTION-4) B

TIME: 20 MINUTES **MAX. MARKS: 15** **29.03.2009**

1. Check whether $L : \mathbb{R}^3 \to \mathbb{R}^3$ by
$L(x, y, z) = (0, 0, 0)$ is a LT?
2. Find the coordinate vector of $2t - 4$ w.r.to the basis $S = \{t-1, t+1\}$.
3. Find the null space of $L : \mathbb{R}^3 \to \mathbb{R}^2$ by
$$L(x, y, z) = (2x + 3y, \ x - z).$$
4. Find the range of $L : P_3 \to P_2$ by
$$L(at^3 + bt^2 + ct + d) = (a-b)t^2 + (2a-c)t.$$
5. Find the LT $L : \mathbb{R}^2 \to \mathbb{R}^2$ by
$$L(2, 3) = (1, -1), \quad L(0, 2) = (1, 2).$$

A

BITS, PILANI – DUBAI

MATH C192 – Mathematics – II

04.03.09

5×3 = 15 marks

QUIZ – I SECTION – 4

Time: 20 min.

1. For what values of 'a', the system
$x + 2y - 3z = 0, \quad 2x + y - 4z = 0, \quad x - y + 9z = 0$ will have non-zero solutions? Justify your answer.

2. Is $S = \{ p \in P \mid p'(x) = x\, p(x) + 2 \}$ a subspace of P? Justify.

3. Is $S = \{ (1,-2,4), (4,-1,5), (3,1,0) \}$ LI? Justify.

4. If $A = \begin{bmatrix} 1 & 3 \\ -1 & 6 \end{bmatrix}$, find A^{-1}.

5. Is $(1,-2,2) \in [S]$ if $S = \{ (2,1,3), (-1,1,4), (2,3,1) \}$. Justify.

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B

BITS, PILANI – DUBAI

04.03.09

MATH C192 – Mathematics – II

Time: 20 min.

5×3 = 15 marks.

QUIZ – I SECTION – 4

1. Find the rank of $\begin{bmatrix} 1 & -1 & 1 \\ 3 & 2 & -4 \\ 2 & 4 & 3 \end{bmatrix}$

2. Is $S = \{ (a,b,c) \mid a + b = -2c \}$ a subspace of $\mathbb{R}^3$? Justify.

3. Is $S = \{ (3,2,7), (1,1,0), (2,4,6) \}$ LI? Justify.

4. If $A^{-1} = \begin{bmatrix} 1 & 2 \\ -1 & 5 \end{bmatrix}$, find A.

5. Is $t^2 - 2t + 5 \in [S]$ if $S = \{ t^2 + 2t - 4, t - 2, t^2 + 5 \}$? Justify.

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BITS, PILANI – DUBAI
INTERNATIONAL ACADEMIC CITY, DUBAI
(I YEAR – II SEMESTER 2008-2009)

Set A

QUIZ – III (CB)

MATHEMATICS-II
(MATH C192)

Max. Marks: 15 Weightage: 5% Date: 22-4-2009 Time: 15 Mins.

Name : ________ Id. No.: ________ Sec.: **II**

NOTE:
Write your Name and Id. No in the space provided.
Attempt all the questions. Total number of questions: 5
Each question carries 3 marks. Specific answer is required, not the formula.
Overwriting/multiple answers will be treated as incorrect answer.

Fill in the blanks with correct answers:

1. The characteristic roots of the matrix $\begin{pmatrix} 1 & 2 \\ 1 & 1 \end{pmatrix}$ are ________ .
2. If $L_1 : R^2 \to R^2$ and $L_2 : R^2 \to R^2$ be two linear transformation defined by $L_1(x, y) = (x + y, x - 2y)$ and $L_2(x, y) = (y, x - y)$, then $(L_2 \circ L_1)(2,2) =$ ________ and $(L_1 \circ L_2)(2,2) =$ ________ .
3. The modulus and the principal argument of $(1+i)^2$ are respectively ________ and ________ .
4. If $f(z) = z + \frac{1}{z} = u(x, y) + iv(x, y)$, then $v(x, y) =$ ________ .
5. The cube roots of 3 will lie on a circle of radius ________ .

BITS, PILANI – DUBAI
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Set - B

QUIZ – III (CB)

MATHEMATICS-II
(MATH C192)

Max. Marks: 15 | Weightage: 5% | Date: 22-4-2009 | Time: 15 Mins.

Name : | Id. No.: | Sec.: **II**

NOTE:
Write your Name and Id. No in the space provided.
Attempt all the questions. Total number of questions: 5
Each question carries 3 marks. Specific answer is required, not the formula.
Overwriting/multiple answers will be treated as incorrect answer.

Fill in the blanks with correct answers:

1. The characteristic polynomial of the matrix $\begin{pmatrix} 1 & 2 \\ 1 & 1 \end{pmatrix}$ is ________________ .

2. If $L_1 : R^2 \to R^2$ and $L_2 : R^2 \to R^2$ be two linear transformation defined by $L_1(x, y) = (x + y, x - 2y)$ and $L_2(x, y) = (y, x - y)$, then $(L_2 \circ L_1)(2,1) =$ ________ and $(L_1 \circ L_2)(2,1) =$ ____________ .

3. The modulus and the principal argument of $(1-i)^2$ are respectively _______ and ____________ .

4. If $f(z) = z + \frac{1}{z} = u(x, y) + iv(x, y)$, then $u(x, y) =$ ________________ .

5. The cube roots of 2 will lie on a circle of radius ____________ .

(A)

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QUIZ – II (CB)

MATHEMATICS-II
(MATH C192)

Max. Marks: 15   Weightage: 5%   Date: 25-3-2009   Time: 15 Mins.

Name : ————   Id. No.: ————   Sec.: II

NOTE:
Write your Name and Id. No in the space provided.
Attempt all the questions. Total number of questions: 5
Each question carries 3 marks. Specific answer is required, not the formula.
Overwriting/multiple answers will be treated as incorrect answer.

Fill in the blanks with correct answers:

1. A system of linear homogeneous equations with four unknowns x, y, z, w has the solution: $x = -2k + 3l, y = -2l, z = k, w = l$ where k and l are arbitrary real numbers. The dimension of the solution space is ______.
2. For a linear transformation $L: V \to W$ if the rank of $L = 2$ and the dim $V = 4$, then the nullity of $L =$ ________.
3. Let $S = \{(1,0), (1,-1)\}$ be an ordered basis of R^2. Then the coordinates of (2,2) with respect to the basis S are ____________.

Tick the correct answer:

4. The linear transformation $L: R^2 \to R^2$ defined by $L(x, y) = (x + y, x - y)$ is

   a) onto but not one-to-one   b) one-to-one but not onto   c) onto and one-to-one
   d) none of these

5. If $L: R^2 \to R^3$ is a linear transformation defined by $L(x, y) = (x, x + y, y)$, then which of the following is true?

   a) $(1,2,3) \in rangeL$ b) $(1,0,-1) \in rangeL$ c) $(4,2,3) \in rangeL$
   d) none of these

(B)

BITS, PILANI – DUBAI
INTERNATIONAL ACADEMIC CITY, DUBAI
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QUIZ – II (CB)

MATHEMATICS-II
(MATH C192)

Max. Marks: 15   Weightage: 5%   Date: 25-3-2009   Time: 15 Mins.

Name : __________   Id. No.: __________   Sec.: II

NOTE:
Write your Name and Id. No in the space provided.
Attempt all the questions. Total number of questions: 5
Each question carries 3 marks. Specific answer is required, not the formula.
Overwriting/multiple answers will be treated as incorrect answer.

Fill in the blanks with correct answers:

1. For a linear transformation $L: V \to W$ if the rank of $L = 2$ and the dim $V = 5$, then the nullity of $L =$ _________ .
2. A system of linear homogeneous equations with four unknowns x, y, z, w has the solution: $x = -2k + 3l, y = -2l, z = k, w = l$ where k and l are arbitrary real numbers. The dimension of the solution space is _______ .
3. Let $S = \{(1,0),(1,-1)\}$ be an ordered basis of R^2. Then the coordinates of (1,2) with respect to the basis S are ______________ .

Tick the correct answer:

4. If $L: R^2 \to R^3$ is a linear transformation defined by $L(x,y) = (x, x+y, y)$, then which of the following is true?

   a) $(1,2,3) \in rangeL$ b) $(1,0,1) \in rangeL$ c) $(-1,2,3) \in rangeL$

   d) none of these

5. The linear transformation $L: R^2 \to R^2$ defined by $L(x,y) = (x+y, x-y)$ is

   a) onto but not one-to-one   b) one-to-one but not onto   c) onto and one-to-one

   d) none of these

(A)

BITS, PILANI – DUBAI
INTERNATIONAL ACADEMIC CITY, DUBAI
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QUIZ – I (CB)

MATHEMATICS-II
(MATH C192)

Max. Marks: 15 Weightage: 5% Date: 04-3-2009 Time: 15 Mins.

Name : __________ Id. No.: __________ Sec.: II

NOTE:
Write your Name and Id. No in the space provided.
Attempt all the questions. Total number of questions: 15
Each question carries 3 marks. Specific answer is required, not the formula.
Overwriting/multiple answers will be treated as incorrect answer.

Fill in the blanks with correct answers:

1. Consider the system: $x+2y=0,\ 3x+(2-\lambda)y=0$. The value of λ for which the above system has non-trivial solution is ________________ .

2. If A is an invertible matrix of order 2, then the reduced row echelon form of A is ________________.

3. The standard or natural basis of P_2 is __________________________ .

4. Which of the following vectors is linearly independent? *(Tick the correct answer)*
   a) $\{(1,2),(2,2),(1,1)\}$ b) $\{(2,1),(0,0)\}$ c) $\{(2,1),(1,2)\}$ d) none of these.

5. If V is a 3-dimensional vector space and W is a nonzero subspace of V, then the set of values that $\dim W$ can take is {__________________}.

(B)

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QUIZ – I (CB)

MATHEMATICS-II
(MATH C192)

Max. Marks: 15 Weightage: 5% Date: 04-3-2009 Time: 15 Mins.

Name : ________ Id. No.: ________ Sec.: II

NOTE:
Write your Name and Id. No in the space provided.
Attempt all the questions. Total number of questions: 15
Each question carries 3 marks. Specific answer is required, not the formula.
Overwriting/multiple answers will be treated as incorrect answer.

Fill in the blanks with correct answers:

1. Consider the system: $x+2y=0, 3x+(3-\lambda)y=0$. The value of λ for which the above system has non-trivial solution is ________________.

2. If A is an invertible matrix of order 3, then the reduced row echelon form of A is

   ________________.

3. The standard or natural basis of P_3 is ____________________________.

4. Which of the following vectors is linearly independent? *(Tick the correct answer)*
   a) $\{(1,2),(2,2),(1,1)\}$ b) $\{(2,1),(0,0)\}$ c) $\{(2,1),(4,2)\}$ d) none of these.

5. If V is a 2-dimensional vector space and W is a nonzero subspace of V, then the set of values that $\dim W$ can take is {__________________}.

To: Exam Branch

BITS, PILANI – DUBAI

DUBAI INTERNATIONAL ACADEMIC CITY

1 YEAR – II SEMESTER 2008-2009

QUIZ-1II (CB)

Course : Mathematics - II　　Section -I　　Course No:MATH C192

Max.Marks:15　　Weightage:5%　　Time:15 Mins. **Dt.7.5.09**

Name:　　ID. No.

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1. The characteristic polynomial of the matrix

$$\begin{matrix} 2 & 3 & 2 \\ 1 & 2 & 0 \\ 2 & -2 & 2 \end{matrix}$$ is ______________.

2. An eigen vector corresponding to the eigen value $\lambda = 4$ for the matrix $\begin{bmatrix} 2 & 3 \\ 2 & 1 \end{bmatrix}$ is______________.

3. The $x+iy$ form of the complex number $5i(3-i2)/_{2+i}$ is________

4. $(\frac{-1+i\sqrt{3}}{2})^{1/3}=$________________.

5. The real component of $Sin(z)$ is ____________________

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1 YEAR – II SEMESTER 2008-2009

QUIZ-II(CB)

Course : Mathematics - II	Section -I	Course No:MATH C192
Max.Marks:15	Weightage:5%	Time:15 Mins. Dt.**29.3.09**

Name: ID. No.

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1. A basis for the solution space of homogeneous system of equations $2x+y-z=0, x-2y-3z=0, -3x-y+2z=0$ is ______________.

2. The coordinate vector of $3+3t+2t^2$ relative to the ordered basis $\{1-t, 1+t, 1-t^2\}$ is____________________________

3. If $L: R^2 \to R^2$ is a linear transformation for which $L(1,2)=(3,0), L(2,1)=(1,2)$ then $L(4,-5)=$ __________________.

4. If $L: R^3 \to R^3$ is a linear transformation defined as $L(x,y,z)=(x+y, x-y, z)$ then the Ker L =___________________.

5. If $L: R^2 \to R^3$ is a linear transformation defined as $L(x,y)=(x-y, x+2y, x)$ then L is

   a) One to one b) Onto

   c) One to one & onto d) None

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1 YEAR – II SEMESTER 2008-2009

QUIZ-1 (CB)

Course : Mathematics - II	Section - I	Course No:MATH C192
Max.Marks:15	Weightage:5%	Time:15 Mins.

Name: ID. No.

---

1. The row reduced echelon form of the matrix

$$A = \begin{bmatrix} 5 & 9 & 2 & -1 \\ 4 & 4 & 1 & -1 \\ 2 & 4 & 1 & -1 \end{bmatrix}$$ is ____________________.

2. If the linear system of equations $\begin{array}{l} x+y-z=2; \\ x+2y+z=3 \\ x+y+(a^2-9)z=a \end{array}$ is consistent, then the value of **'a'** is ______________.

3. Let V be the set of all real numbers, the addition of vectors '+' and scalar multiplication ' *' are defined as
u + **v** = **u** - 3 **v** and c * **u** = c**u** is not a vector space. Give one property, which it fails to satisfy.

BITS, PILANI – DUBAI

DUBAI NTERNATIONAL ACADEMIC CITY

1 YEAR – II SEMESTER 2008-2009

QUIZ-1 (CB)

Course : Mathematics - II	Section - I	Course No:MATH C192
Max.Marks:15	Weightage:5%	Time:15 Mins.

Name: ID. No.

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1. The row reduced echelon form of the matrix

$$A = \begin{bmatrix} 5 & 9 & 2 & -1 \\ 4 & 4 & 1 & -1 \\ 2 & 4 & 1 & -1 \end{bmatrix} \quad \text{is } \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.$$

2. If the linear system of equations $\begin{aligned} x+y-z&=2; \\ x+2y+z&=3 \\ x+y+(a^2-9)z&=a \end{aligned}$ is consistent, then the value of **'a'** is ______________.

3. Let V be the set of all real numbers, the addition of vectors '+' and scalar multiplication ' *' are defined as
u + v = u - 3 v and c * **u** = **cu** is not a vector space. Give one property, which it fails to satisfy.