Code No: NR210101 **NR** **Set No. 2**

II B.TECH – I SEM EXAMINATIONS, NOVEMBER - 2010

MATHEMATICS - II

Common to CE, ME, CHEM, BME, IT, MECT, MEP, AE, E.COMP.E, MMT, ETM, E.CONT.E, EIE, CSE, ECE, CSSE, EEE

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions

All Questions carry equal marks

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1. Show that the matrix A = $\begin{bmatrix} 1 & -2 & 2 \\ 1 & 2 & 3 \\ 0 & -1 & 2 \end{bmatrix}$ Satisfies its characteristic equation. Hence Find A^{-1} [16]

2. An infinitely long plate is bounded by two parallel edges and an end at right angles to them. The breadth is π. This end is maintained at constant temperature u_0 at all points and the other edges are at zero temperature. Find the steady state temperature at any point (x,y) of the plate. [16]

3. (a) Show that every square matrix can be expressed uniquely as a sum of a symmetric and skew symmetric matrices. [8]

   (b) Determine a, b, c so that A is orthogonal where A = $\begin{bmatrix} 0 & 2b & c \\ a & b & -c \\ a & -b & c \end{bmatrix}$ [8]

4. (a) Form the partial differential equation by eliminating the arbitrary function from $\phi\left(\frac{y}{x}, x^2 + y^2 + z^2\right) = 0$. [5]

   (b) Solve the partial differential equation $\frac{x^2}{p} + \frac{y^2}{q} = z$ [5]

   (c) Solve the partial differential equation $x(y^2 + z)p - y(x^2 + z)q = z(x^2 - y^2)$. [6]

5. (a) Find the rank of the matrix by reducing it to the normal form. [8]

   $\begin{bmatrix} 6 & 1 & 3 & 8 \\ 4 & 2 & 6 & -1 \\ 10 & 3 & 9 & 7 \\ 1b & 4 & 12 & 15 \end{bmatrix}$

   (b) Find whether the following set of equations are consistent if so, solve them. [8]

$$2x - y + 3z - 9 = 0$$

$$x + y + z = 6$$

$$x - y + z - 2 = 0$$

6. (a) Prove that Z (a^n f(t)) = F (z/a) [5]

   (b) Find

      i. $Z(-2)^n$ [5]

ii. Z (na^n)

(c) Find the inverse Z - transform of $\frac{z}{(z-1)\,(z-2)}$ [6]

7. (a) Expand $\frac{L}{2}$- x in $-L < x < L.$ [10]

(b) Find the Fourier half range Cosine Series of
$f(x) = \begin{cases} x, & 0 < x < \frac{\pi}{2} \\ 0, & \frac{\pi}{2} < x < \pi \end{cases}$ [6]

8. Solve $\frac{\partial^2 u}{\partial t^2} = \alpha^2 \frac{\partial^2 u}{\partial x^2}$ $-\infty < x < \infty$
$t \geq 0$ with boundary conditions

(a) u(o, t) = 0

(b) u(π, t) = 0

(c) u(x, 0) = f(x)

(d) $\left(\frac{\partial u}{\partial t}\right)_{(x,0)} = 0, \ \ for \ \ 0 < x < \pi, t > 0$ Using Fourier Transforms [16]

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Code No: NR210101 **NR** **Set No. 4**

II B.TECH – I SEM EXAMINATIONS, NOVEMBER - 2010

MATHEMATICS - II

Common to CE, ME, CHEM, BME, IT, MECT, MEP, AE, E.COMP.E, MMT, ETM, E.CONT.E, EIE, CSE, ECE, CSSE, EEE

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions

All Questions carry equal marks

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1. Solve $\frac{\partial^2 u}{\partial t^2} = \alpha^2 \frac{\partial^2 u}{\partial x^2}$ $-\infty < x < \infty$
   $t \geq 0$ with boundary conditions
   (a) u(o, t) = 0
   (b) u(π, t) = 0
   (c) u(x, 0) = f(x)
   (d) $\left(\frac{\partial u}{\partial t}\right)_{(x,0)} = 0, \quad for \;\; 0 < x < \pi, t > 0$ Using Fourier Transforms [16]

2. (a) Show that every square matrix can be expressed uniquely as a sum of a symmetric and skew symmetric matrices. [8]
   (b) Determine a, b, c so that A is orthogonal where A = $\begin{bmatrix} 0 & 2b & c \\ a & b & -c \\ a & -b & c \end{bmatrix}$ [8]

3. (a) Expand $\frac{L}{2}$- x in $-L < x < L.$ [10]
   (b) Find the Fourier half range Cosine Series of
   $f(x) = \begin{cases} x, & 0 < x < \frac{\pi}{2} \\ 0, & \frac{\pi}{2} < x < \pi \end{cases}$ [6]

4. (a) Find the rank of the matrix by reducing it to the normal form. [8]
   $\begin{bmatrix} 6 & 1 & 3 & 8 \\ 4 & 2 & 6 & -1 \\ 10 & 3 & 9 & 7 \\ 1b & 4 & 12 & 15 \end{bmatrix}$
   (b) Find whether the following set of equations are consistent if so, solve them.[8]

$$2x - y + 3z - 9 = 0$$

$$x + y + z = 6$$

$$x - y + z - 2 = 0$$

5. Show that the matrix A = $\begin{bmatrix} 1 & -2 & 2 \\ 1 & 2 & 3 \\ 0 & -1 & 2 \end{bmatrix}$ Satisfies its characteristic equation. Hence Find A^{-1} [16]

6. (a) Form the partial differential equation by eliminating the arbitrary function from $\phi\left(\frac{y}{x}, x^2+y^2+z^2\right)=0$. [5]

   (b) Solve the partial differential equation $\frac{x^2}{p}+\frac{y^2}{q}=z$ [5]

   (c) Solve the partial differential equation $x(y^2+z)p-y(x^2+z)q=z(x^2-y^2)$.[6]

7. (a) Prove that Z (a^n f(t)) = F (z/a) [5]

   (b) Find

      i. $Z(-2)^n$ [5]

      ii. Z (na^n)

   (c) Find the inverse Z - transform of $\frac{z}{(z-1)\,(z-2)}$ [6]

8. An infinitely long plate is bounded by two parallel edges and an end at right angles to them. The breadth is π. This end is maintained at constant temperature u_0 at all points and the other edges are at zero temperature. Find the steady state temperature at any point (x,y) of the plate. [16]

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Code No: NR210101 **NR** **Set No. 1**

II B.TECH – I SEM EXAMINATIONS, NOVEMBER - 2010

MATHEMATICS - II

Common to CE, ME, CHEM, BME, IT, MECT, MEP, AE, E.COMP.E, MMT, ETM, E.CONT.E, EIE, CSE, ECE, CSSE, EEE

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions

All Questions carry equal marks

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1. (a) Prove that Z (a^n f(t)) = F (z/a) [5]

   (b) Find

   i. $Z(-2)^n$ [5]

   ii. Z (na^n)

   (c) Find the inverse Z - transform of $\frac{z}{(z-1)\ (z-2)}$ [6]

2. Solve $\frac{\partial^2 u}{\partial t^2} = \alpha^2 \frac{\partial^2 u}{\partial x^2}$ $-\infty < x < \infty$
   $t \geq 0$ with boundary conditions

   (a) u(o, t) = 0

   (b) u(π, t) = 0

   (c) u(x, 0) = f(x)

   (d) $\left(\frac{\partial u}{\partial t}\right)_{(x,0)} = 0,\ \ for\ \ 0 < x < \pi, t > 0$ Using Fourier Transforms [16]

3. Show that the matrix A = $\begin{bmatrix} 1 & -2 & 2 \\ 1 & 2 & 3 \\ 0 & -1 & 2 \end{bmatrix}$ Satisfies its characteristic equation. Hence Find A^{-1} [16]

4. (a) Expand $\frac{L}{2}$- x in $-L < x < L$. [10]

   (b) Find the Fourier half range Cosine Series of
   $f(x) = \begin{cases} x, & 0 < x < \frac{\pi}{2} \\ 0, & \frac{\pi}{2} < x < \pi \end{cases}$ [6]

5. (a) Form the partial differential equation by eliminating the arbitrary function from $\phi\left(\frac{y}{x}, x^2 + y^2 + z^2\right) = 0$. [5]

   (b) Solve the partial differential equation $\frac{x^2}{p} + \frac{y^2}{q} = z$ [5]

   (c) Solve the partial differential equation $x(y^2 + z)p - y(x^2 + z)q = z(x^2 - y^2)$.[6]

6. (a) Show that every square matrix can be expressed uniquely as a sum of a symmetric and skew symmetric matrices. [8]

   (b) Determine a, b, c so that A is orthogonal where A = $\begin{bmatrix} 0 & 2b & c \\ a & b & -c \\ a & -b & c \end{bmatrix}$ [8]

7. An infinitely long plate is bounded by two parallel edges and an end at right angles to them. The breadth is π. This end is maintained at constant temperature u_0 at all points and the other edges are at zero temperature. Find the steady state temperature at any point (x,y) of the plate. [16]

8. (a) Find the rank of the matrix by reducing it to the normal form. [8]

$$\begin{bmatrix} 6 & 1 & 3 & 8 \\ 4 & 2 & 6 & -1 \\ 10 & 3 & 9 & 7 \\ 1b & 4 & 12 & 15 \end{bmatrix}$$

(b) Find whether the following set of equations are consistent if so, solve them.[8]

$$2x - y + 3z - 9 = 0$$

$$x + y + z = 6$$

$$x - y + z - 2 = 0$$

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Code No: NR210101 **NR** **Set No. 3**

II B.TECH – I SEM EXAMINATIONS, NOVEMBER - 2010

MATHEMATICS - II

Common to CE, ME, CHEM, BME, IT, MECT, MEP, AE, E.COMP.E, MMT, ETM, E.CONT.E, EIE, CSE, ECE, CSSE, EEE

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions

All Questions carry equal marks

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1. Show that the matrix A = $\begin{bmatrix} 1 & -2 & 2 \\ 1 & 2 & 3 \\ 0 & -1 & 2 \end{bmatrix}$ Satisfies its characteristic equation. Hence Find A^{-1} [16]

2. (a) Expand $\frac{L}{2}$- x in $-L < x < L$. [10]

   (b) Find the Fourier half range Cosine Series of
   $f(x) = \begin{cases} x, & 0 < x < \frac{\pi}{2} \\ 0, & \frac{\pi}{2} < x < \pi \end{cases}$ [6]

3. (a) Find the rank of the matrix by reducing it to the normal form. [8]
   $\begin{bmatrix} 6 & 1 & 3 & 8 \\ 4 & 2 & 6 & -1 \\ 10 & 3 & 9 & 7 \\ 1b & 4 & 12 & 15 \end{bmatrix}$

   (b) Find whether the following set of equations are consistent if so, solve them.[8]

$$2x - y + 3z - 9 = 0$$

$$x + y + z = 6$$

$$x - y + z - 2 = 0$$

4. (a) Show that every square matrix can be expressed uniquely as a sum of a symmetric and skew symmetric matrices. [8]

   (b) Determine a, b, c so that A is orthogonal where A = $\begin{bmatrix} 0 & 2b & c \\ a & b & -c \\ a & -b & c \end{bmatrix}$ [8]

5. An infinitely long plate is bounded by two parallel edges and an end at right angles to them. The breadth is π. This end is maintained at constant temperature u_0 at all points and the other edges are at zero temperature. Find the steady state temperature at any point (x,y) of the plate. [16]

6. (a) Form the partial differential equation by eliminating the arbitrary function from $\phi\left(\frac{y}{x}, x^2 + y^2 + z^2\right) = 0$. [5]

   (b) Solve the partial differential equation $\frac{x^2}{p} + \frac{y^2}{q} = z$ [5]

   (c) Solve the partial differential equation $x(y^2 + z)p - y(x^2 + z)q = z(x^2 - y^2)$.[6]

7. Solve $\frac{\partial^2 u}{\partial t^2} = \alpha^2 \frac{\partial^2 u}{\partial x^2}$ $-\infty < x < \infty$
   $t \geq 0$ with boundary conditions
   (a) u(o, t) = 0
   (b) u(π, t) = 0
   (c) u(x, 0) = f(x)
   (d) $\left(\frac{\partial u}{\partial t}\right)_{(x,0)} = 0, \ \ for \ \ 0 < x < \pi, t > 0$ Using Fourier Transforms [16]

8. (a) Prove that Z (a^n f(t)) = F (z/a) [5]
   (b) Find
      i. $Z(-2)^n$ [5]
      ii. Z (na^n)
   (c) Find the inverse Z - transform of $\frac{z}{(z-1)\ (z-2)}$ [6]

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