Code No: R05210101 **R05** **Set No. 2**

II B.Tech I Semester Examinations,November 2010
MATHEMATICS-II
Common to CE, ME, CHEM, MECT, MEP, AE, AME, MMT

Time: 3 hours Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks
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1. (a) Find the finite Fourier cosine transform of f(x) = x^2 in (0, l).
   (b) Find the Fourier sine transform of $\frac{e^{-ax}}{x}$ (a > 0) and deduce that $\int_0^\infty \frac{e^{-ax}-e^{-bx}}{x}$ sin x dx = $\tan^{-1}\left(\frac{b}{s}\right) - \tan^{-1}\left(\frac{a}{s}\right)$. [8+8]

2. (a) Prove that every hermitian matrix can be written as A+ iB where A is real and Symmetric and B is real and Skew-Symmetric.
   (b) Reduce the quadratic form $x_1^2+3x_2^2+3x_3^2-2x_2x_3$ to a canonical form. [6+10]

3. (a) Find the rank of the matrix by reducing it to the normal form.
$$\begin{bmatrix} 1 & 0 & 1 & 0 \\ 3 & -1 & 2 & 1 \\ 2 & 1 & 2 & 1 \\ 2 & -2 & 1 & 0 \end{bmatrix}$$
   (b) Determine whether the following equations will have a non-trivial solution if so solve them.
   3x + 4y - z - 6ω = 0; 2x + 3y + 2z - 3ω = 0
   2x + y - 14z - 9ω = 0; x + 3y + 13z + 3ω = 0. [8+8]

4. Solve the boundary value problem $u_{xx} + u_{yy} = 0$ for 0 < x, y <π. with u (x , 0) = x^2; u (x, π) = 0, u_x (0,y) = 0 = u_x (π, y). [16]

5. (a) If $Z(u_n) = \overline{u}(z)$ and k > 0 then prove that
      i. $Z(u_{n-k}) = z^{-k}\,\overline{u}(z)$
      ii. $Z(u_{n+k}) = z^k\left[\overline{u}(z) - u_o - u_1 z^{-1} u_2 \overline{z}^{-2} ... u_{k-1} z^{-(k-1)}\right]$. [5+5]
   (b) Using convolution theorem evaluate $Z^{-1}\left[\frac{z^2}{(z-1)\,(z-3)}\right]$ [6]

6. (a) Form the partial differential equation by eliminating the arbitrary function from $f\left(x^2+y^2, z-xy\right) = 0$.
   (b) Solve the partial differential equation $(2z-y)\,p + (x+z)\,q + 2x + y = 0$.
   (c) Solve the partial differential equation $z^4P^2 + z^4q^2 = z^3$. [5+6+5]

7. (a) Expand f(x) = cos ax as a Fourier series in (-π, π) where a is not an integer. Hence prove that $\cot\theta = \frac{1}{\theta} + \frac{2\theta}{\theta^2-\pi^2} + \frac{2\theta}{\theta^2-4\pi^2} + ...$
   (b) If $f(x) = x, 0 < x < \frac{\pi}{2}$
   $= \pi - x,\ \frac{\pi}{2} < x < \pi$
   Show that $f(x) = \frac{4}{\pi}\left[\sin x - \frac{1}{3^2}\sin 3x + \frac{1}{5^2}\sin 5x - ....\right]$. [8+8]

8. Diagonalize the matrix $A = \begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{bmatrix}$ and hence findA^4. [16]

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Code No: R05210101 **R05** **Set No. 4**

II B.Tech I Semester Examinations,November 2010
MATHEMATICS-II
Common to CE, ME, CHEM, MECT, MEP, AE, AME, MMT
Time: 3 hours **Max Marks: 80**
Answer any FIVE Questions
All Questions carry equal marks
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1. (a) Prove that every hermitian matrix can be written as A+ iB where A is real and Symmetric and B is real and Skew-Symmetric.
   (b) Reduce the quadratic form $x_1^2+3x_2^2+3x_3^2-2x_2x_3$ to a canonical form. [6+10]

2. Solve the boundary value problem $u_{xx} + u_{yy} = 0$ for $0 < x, y < \pi$. with $u(x, 0) = x^2$; $u(x, \pi) = 0$, $u_x(0,y) = 0 = u_x(\pi, y)$. [16]

3. (a) Find the rank of the matrix by reducing it to the normal form.
$$\begin{bmatrix} 1 & 0 & 1 & 0 \\ 3 & -1 & 2 & 1 \\ 2 & 1 & 2 & 1 \\ 2 & -2 & 1 & 0 \end{bmatrix}$$
   (b) Determine whether the following equations will have a non-trivial solution if so solve them.
   $3x + 4y - z - 6\omega = 0$; $2x + 3y + 2z - 3\omega = 0$
   $2x + y - 14z - 9\omega = 0$; $x + 3y + 13z + 3\omega = 0$. [8+8]

4. (a) Find the finite Fourier cosine transform of $f(x) = x^2$ in $(0, l)$.
   (b) Find the Fourier sine transform of $\frac{e^{-ax}}{x}$ $(a > 0)$ and deduce that
   $\int_0^\infty \frac{e^{-ax}-e^{-bx}}{x} \sin x\,dx = \tan^{-1}\left(\frac{b}{s}\right) - \tan^{-1}\left(\frac{a}{s}\right)$. [8+8]

5. Diagonalize the matrix $A = \begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{bmatrix}$ and hence find A^4. [16]

6. (a) If $Z(u_n) = \overline{u}(z)$ and $k > 0$ then prove that
      i. $Z(u_{n-k}) = z^{-k}\,\overline{u}(z)$
      ii. $Z(u_{n+k}) = z^k\left[\overline{u}(z) - u_o - u_1 z^{-1} u_2 \overline{z}^{-2} ... u_{k-1} z^{-(k-1)}\right]$. [5+5]
   (b) Using convolution theorem evaluate $Z^{-1}\left[\frac{z^2}{(z-1)(z-3)}\right]$ [6]

7. (a) Expand $f(x) = \cos ax$ as a Fourier series in $(-\pi, \pi)$ where a is not an integer. Hence prove that $\cot\theta = \frac{1}{\theta} + \frac{2\theta}{\theta^2-\pi^2} + \frac{2\theta}{\theta^2-4\pi^2} + ...$
   (b) If $f(x) = x, 0 < x < \frac{\pi}{2}$
   $= \pi - x,\ \frac{\pi}{2} < x < \pi$
   Show that $f(x) = \frac{4}{\pi}\left[\sin x - \frac{1}{3^2}\sin 3x + \frac{1}{5^2}\sin 5x - ....\right]$. [8+8]

8. (a) Form the partial differential equation by eliminating the arbitrary function from $f\left(x^2+y^2, z-xy\right)=0$.

   (b) Solve the partial differential equation $(2z-y)\,p+(x+z)\,q+2x+y=0$.

   (c) Solve the partial differential equation $z^4P^2+z^4q^2=z^3$. [5+6+5]

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Code No: R05210101 **R05** **Set No. 1**

II B.Tech I Semester Examinations,November 2010
MATHEMATICS-II
Common to CE, ME, CHEM, MECT, MEP, AE, AME, MMT

Time: 3 hours Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) If $Z(u_n) = \overline{u}(z)$ and $k > 0$ then prove that
   i. $Z(u_{n-k}) = z^{-k}\,\overline{u}(z)$
   ii. $Z(u_{n+k}) = z^k \left[\overline{u}(z) - u_o - u_1 z^{-1} u_2 \overline{z}^{-2} ... u_{k-1} z^{-(k-1)}\right]$. [5+5]

   (b) Using convolution theorem evaluate $Z^{-1}\left[\frac{z^2}{(z-1)\,(z-3)}\right]$ [6]

2. Diagonalize the matrix $A = \begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{bmatrix}$ and hence find A^4. [16]

3. (a) Find the rank of the matrix by reducing it to the normal form.
$\begin{bmatrix} 1 & 0 & 1 & 0 \\ 3 & -1 & 2 & 1 \\ 2 & 1 & 2 & 1 \\ 2 & -2 & 1 & 0 \end{bmatrix}$

   (b) Determine whether the following equations will have a non-trivial solution if so solve them.
   3x + 4y - z - 6ω = 0; 2x + 3y + 2z - 3ω = 0
   2x + y - 14z - 9ω = 0; x + 3y + 13z + 3ω = 0. [8+8]

4. (a) Form the partial differential equation by eliminating the arbitrary function from $f\,(x^2 + y^2, z - xy) = 0$.

   (b) Solve the partial differential equation $(2z - y)\,p + (x + z)\,q + 2x + y = 0$.

   (c) Solve the partial differential equation $z^4P^2 + z^4q^2 = z^3$. [5+6+5]

5. (a) Prove that every hermitian matrix can be written as A+ iB where A is real and Symmetric and B is real and Skew-Symmetric.

   (b) Reduce the quadratic form $x_1^2 + 3x_2^2 + 3x_3^2 - 2x_2x_3$ to a canonical form. [6+10]

6. Solve the boundary value problem $u_{xx} + u_{yy} = 0$ for $0 < x, y < \pi$. with
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7. (a) Expand f(x) = cos ax as a Fourier series in (-π, π) where a is not an integer. Hence prove that $\cot\theta = \frac{1}{\theta} + \frac{2\theta}{\theta^2 - \pi^2} + \frac{2\theta}{\theta^2 - 4\pi^2} + ...$

   (b) If $f(x) = x, 0 < x < \frac{\pi}{2}$
   $= \pi - x,\ \frac{\pi}{2} < x < \pi$
   Show that $f(x) = \frac{4}{\pi}\left[\sin\,x - \frac{1}{3^2}\sin\,3x + \frac{1}{5^2}\sin\,5x - \;...........\right]$. [8+8]

8. (a) Find the finite Fourier cosine transform of f(x) = x^2 in (0, l).

   (b) Find the Fourier sine transform of $\frac{e^{-ax}}{x}$ (a > 0) and deduce that
   $\int_0^\infty \frac{e^{-ax}-e^{-bx}}{x} \sin x \, dx = \tan^{-1}\left(\frac{b}{s}\right) - \tan^{-1}\left(\frac{a}{s}\right)$. [8+8]

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Code No: R05210101 **R05** **Set No. 3**

II B.Tech I Semester Examinations,November 2010
MATHEMATICS-II
Common to CE, ME, CHEM, MECT, MEP, AE, AME, MMT

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

Answer any FIVE Questions
All Questions carry equal marks

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1. Solve the boundary value problem $u_{xx} + u_{yy} = 0$ for $0 < x, y < \pi$. with $u(x, 0) = x^2$; $u(x, \pi) = 0$, $u_x(0, y) = 0 = u_x(\pi, y)$. [16]

2. (a) Find the finite Fourier cosine transform of $f(x) = x^2$ in $(0, l)$.
   (b) Find the Fourier sine transform of $\frac{e^{-ax}}{x}$ $(a > 0)$ and deduce that $\int_0^\infty \frac{e^{-ax} - e^{-bx}}{x} \sin x \, dx = \tan^{-1}\left(\frac{b}{s}\right) - \tan^{-1}\left(\frac{a}{s}\right)$. [8+8]

3. (a) Form the partial differential equation by eliminating the arbitrary function from $f(x^2 + y^2, z - xy) = 0$.
   (b) Solve the partial differential equation $(2z - y)\,p + (x + z)\,q + 2x + y = 0$.
   (c) Solve the partial differential equation $z^4P^2 + z^4q^2 = z^3$. [5+6+5]

4. (a) If $Z(u_n) = \overline{u}(z)$ and $k > 0$ then prove that
      i. $Z(u_{n-k}) = z^{-k}\,\overline{u}(z)$
      ii. $Z(u_{n+k}) = z^k\left[\overline{u}(z) - u_o - u_1z^{-1}u_2\overline{z}^{-2}...u_{k-1}z^{-(k-1)}\right]$. [5+5]
   (b) Using convolution theorem evaluate $Z^{-1}\left[\frac{z^2}{(z-1)\,(z-3)}\right]$ [6]

5. (a) Expand $f(x) = \cos ax$ as a Fourier series in $(-\pi, \pi)$ where a is not an integer. Hence prove that $\cot\theta = \frac{1}{\theta} + \frac{2\theta}{\theta^2 - \pi^2} + \frac{2\theta}{\theta^2 - 4\pi^2} + ...$
   (b) If $f(x) = x, \; 0 < x < \frac{\pi}{2}$
   $= \pi - x, \; \frac{\pi}{2} < x < \pi$
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8. (a) Find the rank of the matrix by reducing it to the normal form.
$$\begin{bmatrix} 1 & 0 & 1 & 0 \\ 3 & -1 & 2 & 1 \\ 2 & 1 & 2 & 1 \\ 2 & -2 & 1 & 0 \end{bmatrix}$$

(b) Determine whether the following equations will have a non-trivial solution if so solve them.

$3x + 4y - z - 6\omega = 0$; $2x + 3y + 2z - 3\omega = 0$

$2x + y - 14z - 9\omega = 0$; $x + 3y + 13z + 3\omega = 0$. [8+8]

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