Code No: R05210201 **R05** **Set No. 2**

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

MATHEMATICS-III

Common to ICE, E.COMP.E, ETM, E.CONT.E, EIE, ECE, EEE

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

Answer any FIVE Questions

All Questions carry equal marks

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1. (a) Evaluate $\int_0^{2\pi} \frac{d\theta}{a+b\cos\theta}$, a>0, b>0 using residue theorem.

   (b) Evaluate $\int_0^{\infty} \frac{dx}{(1+x^2)^2}$ using residue theorem. [8+8]

2. (a) Show that the transformation w=z+1/z maps the circle |z| =c into the ellipse u=(c+1/c) cos θ, v =(c–1/c)sinθ. Also discuss the case when c=1 in detail.

   (b) Find the bilinear transformation which maps the points (2, i, –2) into the points (l, i, –l). [8+8]

3. (a) Prove that $\frac{1}{\sqrt{1-2tx+t^2}} = P_0$(x) + P_1(x) t + P_2(x) t^2+ ....

   (b) Write $J_{5/2}$(x) in finite form. [8+8]

4. (a) Find the analytic function whose imaginary part is f(x,y) = x^3y – xy^3 + xy +x +y where z = x+iy.

   (b) Prove that $\left(\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2}\right)|Real\ f(z)|^2 = 2|f'(z)|^2$ where w =f(z) is analytic. [8+8]

5. (a) Show that when | z + 1 | < 1, $z^{-2} = 1 + \sum_{n=1}^{\infty}(n+1)(z+1)^n$.

   (b) Expand $f(z) = \frac{1}{z^2-z-6}$ about (i) z = -1 (ii) z = 1. [8+8]

6. (a) Evaluate $\int_0^1 x^4\left(\log\frac{1}{x}\right)^3 dx$ using $\beta-\Gamma$ functions.

   (b) Evaluate $\int_0^{\infty}\frac{xdx}{(1+x^6)}$ using $\beta-\Gamma$ functions.

   (c) Evaluate $\int_0^{-1} x^4\sqrt{a^2-x^2}\,dx$ using $\beta-\Gamma$ functions. [5+6+5]

7. (a) Show that $\int_C (z+1)\,dz = 0$ where C is the boundary of the square whose vertices at the points z = 0, z = 1, z = 1+i, z = i.

   (b) If F(a)= $\int_C \frac{3z^2+7z+1)dz}{(z-a)}$ using Cauchy's integral formula where c is $|z| = 2$ find F(1) F(3) F''(1-i). [8+8]

8. (a) Find the residue of f(z) = $\frac{Z^2-2Z}{(Z+1)^2(Z^2+1)}$ at each pole.

(b) Evaluate $\oint\limits_{c} \frac{4-3z}{z(z-1)(z-2)}$ dz where **c** is the circle $|\ z\ | = \frac{3}{2}$ using residue theorem. [8+8]

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Code No: R05210201 **R05** **Set No. 4**

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

MATHEMATICS-III

Common to ICE, E.COMP.E, ETM, E.CONT.E, EIE, ECE, EEE

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

Answer any FIVE Questions

All Questions carry equal marks

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1. (a) Show that $\int\limits_C (z+1)\,dz = 0$ where C is the boundary of the square whose vertices at the points z = 0, z = 1, z = 1+i, z = i.
   (b) If F(a)= $\int\limits_C \frac{3z^2+7z+1)dz}{(z-a)}$ using Cauchy's integral formula where c is $|z| = 2$ find F(1) F(3) F''(1-i). [8+8]

2. (a) Show that the transformation w=z+1/z maps the circle |z| =c into the ellipse u=(c+1/c) cos θ, v =(c–1/c)sinθ. Also discuss the case when c=1 in detail.
   (b) Find the bilinear transformation which maps the points (2, i, –2) into the points (l, i, –l). [8+8]

3. (a) Evaluate $\int\limits_0^1 x^4 \left(\log \frac{1}{x}\right)^3 dx$ using $\beta - \Gamma$ functions.
   (b) Evaluate $\int\limits_0^\infty \frac{xdx}{(1+x^6)}$ using $\beta - \Gamma$ functions.
   (c) Evaluate $\int\limits_0^{-1} x^4\sqrt{a^2 - x^2}\,dx$ using $\beta - \Gamma$ functions. [5+6+5]

4. (a) Find the residue of f(z) = $\frac{Z^2-2Z}{(Z+1)^2(Z^2+1)}$ at each pole.
   (b) Evaluate $\oint\limits_c \frac{4-3z}{z(z-1)(z-2)}$ dz where **c** is the circle | z | = $\frac{3}{2}$ using residue theorem. [8+8]

5. (a) Prove that $\frac{1}{\sqrt{1-2tx+t^2}} = P_0$(x) + P_1(x) t + P_2(x) t^2+ ....
   (b) Write $J_{5/2}$(x) in finite form. [8+8]

6. (a) Evaluate $\int\limits_0^{2\pi} \frac{d\theta}{a+b\cos\theta}$, a>0, b>0 using residue theorem.
   (b) Evaluate $\int\limits_0^\infty \frac{dx}{(1+x^2)^2}$ using residue theorem. [8+8]

7. (a) Show that when | z + 1 | < 1, $z^{-2} = 1 + \sum\limits_{n=1}^{\infty} (n+1)(z+1)^n$.
   (b) Expand $f(z) = \frac{1}{z^2-z-6}$ about (i) z = -1 (ii) z = 1. [8+8]

8. (a) Find the analytic function whose imaginary part is
   f(x,y) = x^3y – xy^3 + xy +x +y where z = x+iy.

(b) Prove that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right) |Real\ f(z)|^2 = 2|f'(z)|^2$ where w =f(z) is analytic. [8+8]

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Code No: R05210201 **R05** **Set No. 1**

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

MATHEMATICS-III

Common to ICE, E.COMP.E, ETM, E.CONT.E, EIE, ECE, EEE

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

Answer any FIVE Questions

All Questions carry equal marks

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1. (a) Find the analytic function whose imaginary part is f(x,y) = $x^3y - xy^3$ + xy +x +y where z = x+iy.
   (b) Prove that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right) |Real\ f(z)|^2 = 2|f'(z)|^2$ where w =f(z) is analytic. [8+8]

2. (a) Evaluate $\int_0^{2\pi} \frac{d\theta}{a+b\cos\theta}$, a>0, b>0 using residue theorem.
   (b) Evaluate $\int_0^{\infty} \frac{dx}{(1+x^2)^2}$ using residue theorem. [8+8]

3. (a) Show that the transformation w=z+1/z maps the circle |z| =c into the ellipse u=(c+1/c) cos θ, v =(c–1/c)sinθ. Also discuss the case when c=1 in detail.
   (b) Find the bilinear transformation which maps the points (2, i, –2) into the points (l, i, –l). [8+8]

4. (a) Evaluate $\int_0^1 x^4 \left(\log \frac{1}{x}\right)^3 dx$ using $\beta - \Gamma$ functions.
   (b) Evaluate $\int_0^{\infty} \frac{xdx}{(1+x^6)}$ using $\beta - \Gamma$ functions.
   (c) Evaluate $\int_0^{-1} x^4\sqrt{a^2 - x^2}\, dx$ using $\beta - \Gamma$ functions. [5+6+5]

5. (a) Find the residue of f(z) = $\frac{Z^2-2Z}{(Z+1)^2(Z^2+1)}$ at each pole.
   (b) Evaluate $\oint_c \frac{4-3z}{z(z-1)(z-2)}$ dz where **c** is the circle | z | = $\frac{3}{2}$ using residue theorem. [8+8]

6. (a) Prove that $\frac{1}{\sqrt{1-2tx+t^2}} = P_0$(x) + P_1(x) t + P_2(x) t^2+ ....
   (b) Write $J_{5/2}$(x) in finite form. [8+8]

7. (a) Show that when | z + 1 | < 1, $z^{-2} = 1 + \sum_{n=1}^{\infty} (n+1)(z+1)^n$.
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8. (a) Show that $\int_C (z+1)\, dz = 0$ where C is the boundary of the square whose vertices at the points z = 0, z = 1, z = 1+i, z = i.

(b) If F(a)= $\int\limits_C \frac{3z^2+7z+1)dz}{(z-a)}$ using Cauchy's integral formula where c is $|z| = 2$ find F(1) F(3) F''(1-i). [8+8]

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Code No: R05210201 **R05** **Set No. 3**

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

MATHEMATICS-III

Common to ICE, E.COMP.E, ETM, E.CONT.E, EIE, ECE, EEE

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

Answer any FIVE Questions

All Questions carry equal marks

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1. (a) Find the residue of f(z) = $\frac{Z^2-2Z}{(Z+1)^2(Z^2+1)}$ at each pole.

   (b) Evaluate $\oint_c \frac{4-3z}{z(z-1)(z-2)}$ dz where **c** is the circle | z | = $\frac{3}{2}$ using residue theorem. [8+8]

2. (a) Evaluate $\int_0^{2\pi} \frac{d\theta}{a+b\cos\theta}$, a>0, b>0 using residue theorem.

   (b) Evaluate $\int_0^{\infty} \frac{dx}{(1+x^2)^2}$ using residue theorem. [8+8]

3. (a) Prove that $\frac{1}{\sqrt{1-2tx+t^2}} = P_0$(x) + P_1(x) t + P_2(x) t^2+ ....

   (b) Write $J_{5/2}$(x) in finite form. [8+8]

4. (a) Find the analytic function whose imaginary part is f(x,y) = x^3y – xy^3 + xy +x +y where z = x+iy.

   (b) Prove that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right) |Real\ f(z)|^2 = 2|f'(z)|^2$ where w =f(z) is analytic. [8+8]

5. (a) Show that when | z + 1 | < 1, $z^{-2} = 1 + \sum_{n=1}^{\infty} (n+1)(z+1)^n$.

   (b) Expand $f(z) = \frac{1}{z^2-z-6}$ about (i) z = -1 (ii) z = 1. [8+8]

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   (b) If F(a)= $\int_C \frac{3z^2+7z+1)dz}{(z-a)}$ using Cauchy's integral formula where c is $|z|$ = 2 find F(1) F(3) F''(1-i). [8+8]

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   (b) Evaluate $\int_0^{\infty} \frac{xdx}{(1+x^6)}$ using $\beta - \Gamma$ functions.

(c) Evaluate $\int_{0}^{-1} x^4\sqrt{a^2 - x^2}\, dx$ using $\beta - \Gamma$ functions. [5+6+5]

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