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Code No: NR220202 **NR** **Set No. 2**

II B.Tech II Semester Examinations,November 2010
MATHEMATICS - III
Common to ME, MECT, AE, MMT, 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) Expand log z by Taylor's series about z=1
   (b) Expand $\frac{1}{(z^2+1)(z^2+2)}$ in positive and negative powers of z if $1 < |z| < \sqrt{2}$ [8+8]

2. (a) Use method of contour integration to prove that $\int_0^{2\pi} \frac{d\theta}{1+a^2-2aCos\theta} = \frac{2\pi}{1-a^2}$, 0<a<1
   (b) Evaluate $\int_0^{\infty} \frac{dx}{(x^2+9)(x^2+4)^2}$ using residue theorem. [8+8]

3. (a) When n is a +ve integer prove that $P_n(x) = \frac{1}{\pi}\int_0^{\pi} (x \pm \sqrt{x^2-1}\cos\theta)^n d\theta$
   (b) Prove that $\int_0^1 x J_n(\alpha x) J_n(\beta x) dx = 0,\ \alpha \neq \beta$
   $= \frac{1}{2}\left[J_{n+1}^{(\alpha)}\right]^2,\ \alpha = \beta$
   where α and β are the roots of $J_n(x) = 0$ [8+8]

4. (a) Discuss the transformation w=cos z.
   (b) Find the bilinear transformation which maps the points (l, i, -l) into the points (o,1,∞). [8+8]

5. (a) Evaluate $\int_0^{\pi/2} \sin^2\theta \cos^4\theta d\theta = \frac{5\pi}{256}$ using $\beta - \Gamma$ functions.
   (b) Prove that $\int_0^{\infty} \frac{e^{-x^2}}{\sqrt{x}} dx = \int_0^{\infty} x^2 e^{-x^4} dx$ using $\beta - \Gamma$ functions and evaluate the integral.
   (c) Show that $\int_0^{\infty} \frac{x^{m-1}}{(x+a)^{m+n}} dx = a^{-n}\beta(m,n)$ [5+6+5]

6. (a) State necessary condition for f (z) to be analytic and derive C - R equations in Cartesian coordinates.
   (b) If u and v are functions of x and y satisfying Laplace's equations show that s + it is analystic where s = $\frac{\partial u}{\partial y} - \frac{\partial v}{\partial x}$ *and* $= \frac{\partial u}{\partial x} + \frac{\partial v}{\partial y}$ [8+8]

7. (a) Find the poles and residues at each pole of the function $\frac{ze^z}{(z-1)^3}$.
   (b) Evaluate $\int_C \frac{2e^z dz}{z(z-3)}$ where C is |z| = 2 by residue theorem. [8+8]

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8. (a) Evaluate $\int\limits_C \frac{dz}{e^z(z-1)^3}$ where C: $|\,z\,| = 2$ using Caucy's integral theorem.

   (b) Evaluate $\int\limits_{-2+i}^{5+i} z^3 dz$ using Cauchy's integral formula along y = x.

   (c) $\int (x+y)dx + (x^2y)dy$ along y=x^2 from (0,0) to (3,i) [5+5+6]

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Code No: NR220202 **NR** **Set No. 4**

II B.Tech II Semester Examinations,November 2010
MATHEMATICS - III
Common to ME, MECT, AE, MMT, 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 poles and residues at each pole of the function $\frac{ze^z}{(z-1)^3}$.
   (b) Evaluate $\int\limits_C \frac{2e^z dz}{z(z-3)}$ where C is |z| = 2 by residue theorem. [8+8]

2. (a) Discuss the transformation w=cos z.
   (b) Find the bilinear transformation which maps the points (l, i, -l) into the points (o,1,∞). [8+8]

3. (a) Expand log z by Taylor's series about z=1
   (b) Expand $\frac{1}{(z^2+1)(z^2+2)}$ in positive and negative powers of z if $1 < |z| < \sqrt{2}$ [8+8]

4. (a) Evaluate $\int\limits_C \frac{dz}{e^z(z-1)^3}$ where C: $|z| = 2$ using Caucy's integral theorem.
   (b) Evaluate $\int\limits_{-2+i}^{5+i} z^3 dz$ using Cauchy's integral formula along y = x.
   (c) $\int (x+y)dx + (x^2y)dy$ along y=x^2 from (0,0) to (3,i) [5+5+6]

5. (a) Evaluate $\int\limits_0^{\pi/2} \sin^2\theta\cos^4\theta d\theta = \frac{5\pi}{256}$ using $\beta - \Gamma$ functions.
   (b) Prove that $\int\limits_0^\infty \frac{e^{-x^2}}{\sqrt{x}}dx = \int\limits_0^\infty x^2e^{-x^4}dx$ using $\beta - \Gamma$ functions and evaluate the integral.
   (c) Show that $\int\limits_0^\infty \frac{x^{m-1}}{(x+a)^{m+n}}dx = a^{-n}\beta(m,n)$ [5+6+5]

6. (a) When n is a +ve integer prove that $P_n(\mathrm{x}) = \frac{1}{\pi}\int\limits_0^\pi (x \pm \sqrt{x^2-1}\cos\theta)^n \mathrm{d}\theta$
   (b) Prove that $\int\limits_0^1 xJ_n(\alpha x)J_n(\beta x)dx = 0,\ \alpha \neq \beta$
   $$=\frac{1}{2}\left[J_{n+1}^{(\alpha)}\right]^2,\ \alpha = \beta$$
   where α and β are the roots of $J_n(x) = 0$ [8+8]

7. (a) Use method of contour integration to prove that $\int\limits_0^{2\pi} \frac{d\theta}{1+a^2-2aCos\theta} = \frac{2\pi}{1-a^2}$, 0<a<l

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(b) Evaluate $\int_0^\infty \frac{dx}{(x^2+9)(x^2+4)^2}$ using residue theorem. [8+8]

8. (a) State necessary condition for f (z) to be analytic and derive C - R equations in Cartesian coordinates.

(b) If u and v are functions of x and y satisfying Laplace's equations show that s + it is analystic where s = $\frac{\partial u}{\partial y} - \frac{\partial v}{\partial x}$ *and* $= \frac{\partial u}{\partial x} + \frac{\partial v}{\partial y}$ [8+8]

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Code No: NR220202 **NR** **Set No. 1**

II B.Tech II Semester Examinations,November 2010
MATHEMATICS - III
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Time: 3 hours **Max Marks: 80**
Answer any FIVE Questions
All Questions carry equal marks
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1. (a) Find the poles and residues at each pole of the function $\frac{ze^z}{(z-1)^3}$.
   (b) Evaluate $\int_C \frac{2e^z dz}{z(z-3)}$ where C is |z| = 2 by residue theorem. [8+8]

2. (a) Use method of contour integration to prove that $\int_0^{2\pi} \frac{d\theta}{1+a^2-2aCos\theta} = \frac{2\pi}{1-a^2}$, 0<a<l
   (b) Evaluate $\int_0^{\infty} \frac{dx}{(x^2+9)(x^2+4)^2}$ using residue theorem. [8+8]

3. (a) When n is a +ve integer prove that $P_n(\mathrm{x}) = \frac{1}{\pi}\int_0^{\pi} (x \pm \sqrt{x^2-1}\cos\theta)^n \mathrm{d}\theta$
   (b) Prove that $\int_0^1 xJ_n(\alpha x)J_n(\beta x)dx = 0,\ \alpha \neq \beta$
   $=\frac{1}{2}\left[J_{n+1}^{(\alpha)}\right]^2,\ \alpha = \beta$
   where α and β are the roots of $J_n(x) = 0$ [8+8]

4. (a) State necessary condition for f (z) to be analytic and derive C - R equations in Cartesian coordinates.
   (b) If u and v are functions of x and y satisfying Laplace's equations show that s + it is analystic where s = $\frac{\partial u}{\partial y} - \frac{\partial v}{\partial x}$ *and* = $\frac{\partial u}{\partial x} + \frac{\partial v}{\partial y}$ [8+8]

5. (a) Discuss the transformation w=cos z.
   (b) Find the bilinear transformation which maps the points (l, i, -l) into the points (o,1,∞). [8+8]

6. (a) Evaluate $\int_C \frac{dz}{e^z(z-1)^3}$ where C: $|\,z\,| = 2$ using Caucy's integral theorem.
   (b) Evaluate $\int_{-2+i}^{5+i} z^3dz$ using Cauchy's integral formula along y = x.
   (c) $\int (x+y)dx + (x^2y)dy$ along y=x^2 from (0,0) to (3,i) [5+5+6]

7. (a) Evaluate $\int_0^{\pi/2} \sin^2\theta\cos^4\theta d\theta = \frac{5\pi}{256}$ using $\beta - \Gamma$ functions.
   (b) Prove that $\int_0^{\infty} \frac{e^{-x^2}}{\sqrt{x}}dx = \int_0^{\infty} x^2e^{-x^4}dx$ using $\beta - \Gamma$ functions and evaluate the integral.

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(c) Show that $\int_0^\infty \frac{x^{m-1}}{(x+a)^{m+n}} dx = a^{-n}\beta(m,n)$ [5+6+5]

8. (a) Expand log z by Taylor's series about z=1

(b) Expand $\frac{1}{(z^2+1)(z^2+2)}$ in positive and negative powers of z if $1 < |z| < \sqrt{2}$ [8+8]

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Code No: NR220202 **NR** **Set No. 3**

II B.Tech II Semester Examinations,November 2010
MATHEMATICS - III
Common to ME, MECT, AE, MMT, 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 poles and residues at each pole of the function $\frac{ze^z}{(z-1)^3}$.
   (b) Evaluate $\int_C \frac{2e^z dz}{z(z-3)}$ where C is |z| = 2 by residue theorem. [8+8]

2. (a) Evaluate $\int_0^{\pi/2} \sin^2\theta\cos^4\theta d\theta = \frac{5\pi}{256}$ using $\beta - \Gamma$ functions.
   (b) Prove that $\int_0^\infty \frac{e^{-x^2}}{\sqrt{x}}dx = \int_0^\infty x^2 e^{-x^4}dx$ using $\beta - \Gamma$ functions and evaluate the integral.
   (c) Show that $\int_0^\infty \frac{x^{m-1}}{(x+a)^{m+n}}dx = a^{-n}\beta(m, n)$ [5+6+5]

3. (a) Discuss the transformation w=cos z.
   (b) Find the bilinear transformation which maps the points (l, i, -l) into the points (o,1,∞). [8+8]

4. (a) State necessary condition for f (z) to be analytic and derive C - R equations in Cartesian coordinates.
   (b) If u and v are functions of x and y satisfying Laplace's equations show that s + it is analystic where s = $\frac{\partial u}{\partial y} - \frac{\partial v}{\partial x}$ *and* = $\frac{\partial u}{\partial x} + \frac{\partial v}{\partial y}$ [8+8]

5. (a) Use method of contour integration to prove that $\int_0^{2\pi} \frac{d\theta}{1+a^2-2aCos\theta} = \frac{2\pi}{1-a^2}$, 0<a<l
   (b) Evaluate $\int_0^\infty \frac{dx}{(x^2+9)(x^2+4)^2}$ using residue theorem. [8+8]

6. (a) Expand log z by Taylor's series about z=1
   (b) Expand $\frac{1}{(z^2+1)(z^2+2)}$ in positive and negative powers of z if $1 < |z| < \sqrt{2}$ [8+8]

7. (a) When n is a +ve integer prove that P_n(x) = $\frac{1}{\pi}\int_0^\pi (x \pm \sqrt{x^2-1}\cos\theta)^n$dθ
   (b) Prove that $\int_0^1 xJ_n(\alpha x)J_n(\beta x)dx = 0,\ \alpha \neq \beta$

   $$=\frac{1}{2}\left[J_{n+1}^{(\alpha)}\right]^2,\ \alpha = \beta$$

   where α and β are the roots of $J_n(x) = 0$ [8+8]

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8. (a) Evaluate $\int\limits_C \frac{dz}{e^z(z-1)^3}$ where C: $|\,z\,| = 2$ using Caucy's integral theorem.

   (b) Evaluate $\int\limits_{-2+i}^{5+i} z^3 dz$ using Cauchy's integral formula along y = x.

   (c) $\int (x+y)dx + (x^2y)dy$ along y=x^2 from (0,0) to (3,i) [5+5+6]

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