

Code: R7 210201

B.Tech II Year I Semester (R07) Supplementary Examinations, May 2012

MATHEMATICS - III

(Common to EEE, ECE, EIE, E.Con.E and ECC)

Time: 3 hours

Max Marks: 80

Answer any FIVE questions

All questions carry equal marks

- 1 (a) Evaluate $\int_0^1 x^4 (\log \frac{1}{x})^3 dx$.
 (b) Prove that $\int_0^1 \frac{x dx}{\sqrt{1-x^5}} = \frac{1}{5} \beta(\frac{2}{5}, \frac{1}{5})$.
 (c) Explain $x^3 + 2x^2 - x - 3$ in terms of legendre polynomials.
- 2 (a) Show that $(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}) \log |f^1(z)| = 0$ where $f(z)$ is an analytic function.
 (b) Find the analytic function $f(z) = 4 + u + iv$ if $u+v = \frac{\sin 2x}{\cos 2y - \cos 2x}$.
- 3 (a) Find all the values of z which satisfy (i) $e^z = -2$ (ii) $e^z = 1 + i$.
 (b) Find the real and imaginary parts of e^{z^3} .
- 4 (a) Evaluate $\int_{(0,0)}^{(1,1)} (3x^2 + 4xy + i x^2) dz$ along $y = x^2$.
 (b) Evaluate $\int_C \frac{z+4}{z^2+2z+5} dz$ where C is the circle $|z| = 1$.
- 5 (a) Expand $f(z) = \frac{z^2-4}{z^2+5z+4}$ valid for $|z| < 1$.
 (b) Find the current's series expression of the function $f(z) = z^2 - 6z - 1/(z-1)(z-3)(z+2)$ in the region $3 < |z+2| < 5$.
- 6 (a) Find the poles and the corresponding residue of
 (i) $\frac{z+1}{z^2(z-2)}$ (ii) $\frac{1-e^{2z}}{z^4}$
 (b) Evaluate $\int_C \frac{d\theta}{2+\cos\theta}$
- 7 Show that the equation $z^4 + 4(1+i)z + 1 = 0$ has one root in each quadrant.
- 8 (a) Find the image of the infinite strip $0 < y < \frac{1}{2}$ under the transformation $w = 1/z$.
 (b) Show that the transformation $w = \frac{2z+3}{z-4}$ changes the circle $x^2 + y^2 - 4x = 0$.
