

Code: 9A21501

B.TECH III Year I Semester (R09) Supplementary Examinations, May 2012

MATHEMATICS FOR AEROSPACE ENGINEERING

(Aeronautical Engineering)

Time: 3 hours

Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

1 (a) Show that:

$$(1 - 2xt + t^2)^{-1/2} = \sum_{n=1}^{\infty} t^n P_n(x)$$

(b) (i) State and prove Rodrigue's formula. (ii) Express $J_5(x)$ in terms of $J_0(x)$ and $J_1(x)$.

2 (a) Prove that the function $f(z) = \sqrt{|xy|}$ is not analytic at the origin, through Cauchy-Riemann equations are satisfied at the origin.

(b) Show that $u = \sin x \cosh y + 2 \cos x \cdot \sinh y + x^2 - y^2 + 4xy$ satisfies the Laplace equation. Find the corresponding analytic function.

3 (a) Evaluate $\int_C (y^2 + z^2)dx + (z^2 + x^2)dy + (x^2 + y^2)dz$ from (0, 0, 0) to (1, 1, 1) where C is the curve $x = t, y = t^2, z = t^3$ in parametric form.

(b) State and prove Cauchy's integral formula.

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

(ii) Find the poles of $f(z) = \frac{z^2 - 2z}{(z+1)^2(z^2+1)}$, and the residues at these poles

(b) State and prove Liouville theorem.

5 (a) If $\omega = \frac{1+iz}{1-iz}$, find the image of $|z| < 1$.

(b) (i) Define fixed point of the transformation.

(ii) Find the bilinear transformation which maps the points $z = 1, i, -1$, respectively on to $\omega = i, 0, -i$.

6 (a) (i) Define contravariant tensors.

(ii) Prove that the contraction of the outer product of the tensors A^p and B_q is invariant.

(b) Write the transformation law of Christoffel symbol of second kind.

7 (a) (i) Define conditional probability. (ii) State and prove Baye's theorem.

(b) In a normal distribution, 31% of the items are under 45 and 8% are over 64. Find the mean and standard deviation of the distribution.

8 (a) Prove that the mean and variance of Poisson distribution is equal.

(b) Suppose that x has a Poisson distribution. If $P(x=2) = \frac{2}{3} P(x=1)$ find (i) $P(x=0)$. (ii) $P(x=3)$.
