Code No: 07A4BS04 **R07** **Set No. 4**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
II B.TECH II SEM–REGULAR/SUPPLEMENTARY EXAMINATIONS MAY – 2010
MATHEMATICS FOR AEROSPACE ENGINEERS
Aeronautical Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

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1. Evaluate the following, using β and Γ Functions
   (a) $\int_0^\infty y^{-3/2}(1-e^{-y})\,dy$
   (b) $\int_0^1 x^m (\log x)^n\,dx$ where m > -1 and n is a positive integer
   (c) $\int_0^\infty e^{-x^2} x^{7/2}\,dx$. [6+5+5]

2. (a) the components of a tensor are zero in one coordinate system, then prove that the components are zero in all coordinate systems.
   (b) With the usual notation, prove that $\{i_{ij}\} = \partial/\partial x^i \left(\log\sqrt{g}\right)$ [8+8]

3. (a) Find the image and sketch the mapping of the region $2 \le x \le 3$ and $3 \le y \le 4$. under the transformation $w = e^z$.
   (b) Show that a bilinear transformation preserves the cross ratio of four points. [8+8]

4. (a) Find the analytic function whose imaginary part is $\frac{2\sin x \sin y}{\cos 2x + \cosh 2y}$
   (b) If $\tan[(x+iy)] = a+ib$, then show that $\frac{2a}{1-a^2-b^2} = \tan[\log(x^2+y^2)]$ [8+8]

5. (a) Evaluate $\int_c \frac{e^z}{z(1-z)^3} dz$ if
      i. z=1 lies inside c and z=0 lies outside and
      ii. Z=0 and z=1 both lie inside c.
   (b) Using Cauchy's integral formula, evaluate $\int\limits_c \frac{z^3-2z+1}{z^2(z-i)^2} dz$ where c is the circle $|z| = 2$ [8+8]

6. (a) Find the poles and residues at each pole of $f(z) = \frac{1-e^z}{z^4}$
   (b) Evaluate $\int_c \frac{(z-3)}{z^2+2z+5} dz$ where C is the circle
      i. $|z| = 1$
      ii. $|z+1-i| = 2$, by using residue theorem. [6+10]

7. (a) If X is a random variable with distribution function given by,
   $F(x) = 1 - e^{\lambda x}$ for $0 \le x \le \infty$
   $= 0$ $otherwise$
   Find p.d.f of X. Determine the mean and variance of the distribution.
   (b) Show that Poisson distribution is a limiting case of binomial distribution. [8+8]

8. (a) A person takes 4 tests in succession. The probability of his passing the first test is p, while that of his passing each succeeding test is p or p/2 according as he passes or fails in the preceding test. He qualifies provided he passes at least three tests. Find the probability of his qualifying.

   (b) A consulting firm rents cars from three agencies in the following manner. 20% of cars from agency D, 20% of cars from agency E, 60% of cars from agency F. If 10% of the cars from D, 12% of the cars from E and 4% of the cars from F have bad tyres. If a car received by the firm is found to have bad tyres, what is the probability that the car was supplied by the agency F? [8+8]

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