

Code No: 09A30201

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD

B.Tech II Year I Semester Examinations, June/July-2014

MATHEMATICS-III

(Common to EEE, ECE, EIE, ETM, ECOMPE, ICE, AGE)

Time: 3 hours

Max. Marks: 75

Answer any five questions  
All questions carry equal marks

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- 1.a) Using Beta and Gamma function, evaluate the integral  $\int_{-1}^1 (1-x^2)^n dx$  where  $n$  is a positive integer.
- b) If  $n > -1$ , prove that  $\int_0^x x^{-n} J_{n+1}(x) dx = \frac{1}{2^n \Gamma(n+1)} - x^{-n} J_n(x)$ .
- 2.a) If  $f(x) = 0$ , if  $-1 < x < 0$   
 $= 1$ , if  $0 < x < 1$   
then show that  $f(x) = \frac{1}{2} P_0(x) + \frac{3}{4} P_1(x) - \frac{7}{16} P_3(x) + \dots$
- b) Prove that  $T_5(x) = 16x^5 - 20x^3 + 5x$ , where  $T_n$  is the Chebyshev polynomial of first kind.
- 3.a) Show that the function  $f(z) = z$  is not analytic at  $z = \infty$ .
- b) Prove that the function  $u = x^3 - 3xy^2 + 3x^2 - 3y^2 + 1$  satisfies Laplace's equation and determine the corresponding analytic function.
- 4.a) State and prove Cauchy integral formula.
- b) Integrate  $z^2$  along the straight line OB and along the path OAB consisting of two straight line segments OA and AB, where O is the origin, A is the point  $z = 3$  and B is  $z = 3+i$ .
- 5.a) Let  $a$  be an isolated singularity of  $f(z)$  and if  $|f(z)|$  is bounded on some neighborhood of  $a$ , then, Prove that  $a$  is a removable singularity.
- b) If  $0 < |z-1| < 2$  then express  $f(z) = \frac{z}{(z-1)(z-3)}$  in a series of positive and negative powers of  $(z-1)$ .
6. Evaluate  $\int_{-\infty}^{\infty} \frac{z^2 - z + 2}{z^4 + 10z^2 + 9} dz$ .
- 7.a) Show that every bilinear transformation maps the circles in the  $z$ -plane onto the circles in the  $w$ -plane.
- b) Find the bilinear transformation that maps the points  $(\infty, i, 0)$  into the points  $(0, i, \infty)$ .
- 8.a) Explain the procedure for finding a spanning tree of graph G using Depth-First Search method.
- b) Find the spanning tree for the following graph by applying BFS Algorithm.

