

Code No: 53007

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD

B.Tech II Year I Semester Examinations, November - 2015

MATHEMATICS-III

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

Time: 3 hours

Max. Marks: 75

Answer any five questions
All questions carry equal marks

- 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 $\int_0^x x^{-n} J_{n+1}(x) dx = \frac{1}{2^n \Gamma(n+1)} - x^{-n} J_n(x)$. [8+7]
- 2.a) Prove that $\int_{-1}^1 (P_n')^2 dx = n(n+1)$.
- b) Show that $\frac{\sqrt{1-x^2}}{1-2xt+t^2} = \sum_{n=1}^{\infty} U_{n+1}(x)t^n$. [7+8]
- 3.a) Find an analytic function whose imaginary part is $e^x(x \sin y + y \cos y)$.
- b) Show that the function $f(z) = e^z$ is an entire function. [8+7]
- 4.a) Evaluate $\int_c (y-x-3x^2i) dz$, where c consists of the line segments from $z=0$ to $z=i$ and the other from $z=i$ to $z=1+i$.
- b) Evaluate $\int_c \frac{e^{2z}}{(z+1)^4} dz$, around $c: |z-1|=3$. [8+7]
- 5.a) Find Laurent expansion of $\frac{1}{z^2-4z+3}$ for $1 < |z| < 3$.
- b) Expand $f(z) = \frac{z-1}{z+1}$ in Taylor's series method about the point (i) $z=0$ (ii) $z=1$. [7+8]
6. Evaluate $\int_0^{2\pi} \frac{\sin^2 \theta}{a+b \cos \theta} d\theta$; ($a > b > 0$). [15]
- 7.a) Show that every bilinear transformation maps the circles in the z -plane onto the circles in the w -plane.
- b) Determine the region of the w -plane into which the first quadrant of z -plane is mapped by the transformation $w = z^2$. [7+8]
8. Define the following:
- A simple path from a vertex u to a vertex v
 - A circuit
 - Reachability of a vertex v from a vertex u
 - Connected graph
 - Hamiltonian path. [3+3+3+3+3]