JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD
B.Tech II Year I Semester Examinations, November/December-2013
Mathematics-III
(Common to EEE, ECE, EIE, ETM, ECOMPE, ACE)

Time: 3 hours   Max. Marks: 75

Answer any five questions
All questions carry equal marks
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1.a)   Evaluate $\int\limits_{0}^{1} x^4 \left(\log\frac{1}{x} \right)^3 dx$.

   b)   State and prove generating function for $J_n(x)$.   [15]

2.a)   Prove that $(2n+1)\, P_n(x) = P^1_{n+1}(x) - P^1_{n-1}(x)$.

   b)   Prove that $\int\limits_{-1}^{1} x P_n(x) P_{n-1}(x)\, dx = \dfrac{2n}{4n^2 - 1}$.   [15]

3.a)   Show that the function $f(x) = \begin{cases} \dfrac{x^3 y(y - ix)}{x^6 + y^2}, & z \neq 0 \\ \\ 0, & z = 0 \end{cases}$ is not differentiable at the

   origin.
   b)   Find all the roots of Sin z = 2.   [15]

4.a)   Evaluate $\int\limits_{0}^{1+i} (x^2 + iy)\, dz$ along the path y = x and y = x^2.

   b)   Use Cauchy's Integral formula to evaluate $\int\limits_{C} \dfrac{z-1}{(z+1)^2 (z-2)}\, dz$, where 'C' is the

   circle $|z - i| = 2$.   [15]

5.a)   Find the Taylor's series expansion of e^z about z = 3.

   b)   Expand $f(z) = \dfrac{z^2 - 4}{z^2 + 5z + 4}$ in the region $1 < |z| < 4$.   [15]

6.a)   Evaluate $\int\limits_{C} \dfrac{4 - 3z}{z(z-1)(z-2)}\, dz$, where 'C' is the circle $|z| = \dfrac{3}{2}$ using Residue

   theorem.

   b)   Evaluate by contour Integration $\int\limits_{0}^{\infty} \dfrac{dx}{1 + x^2}$.   [15]

7.a)   Show that the function $w = \dfrac{4}{z}$ transforms the straight line x=c in the z-plane in to

   a circle in the w-plane.

   b)   Under the transformation $w = \dfrac{z - i}{1 - iz}$ find the image of the circle

   (i) $|w| = 1$ (ii) $|z| = 1$ in the w-plane.   [15]

8.a) Draw the undirected graph represented by the adjacency matrix A given below.

$$A = \begin{bmatrix} 1 & 2 & 0 & 0 \\ 3 & 0 & 1 & 1 \\ 0 & 1 & 2 & 2 \\ 0 & 1 & 2 & 0 \end{bmatrix}$$

b) Suppose all vertices in a graph have odd degree 'K' Show that total number of edges in G is multiple of K.

[15]

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