Code No: OR220556 **OR**

II B.Tech II Semester Supplementary Examinations, April/May 2005
MATHEMATICS-III
(Common to Electrical & Electronic Engineering, Electronics & Communication Engineering, Electronics & Instrumentation Engineering, Bio-Medical Engineering, Electronics & Control Engineering, Electronics & Telematics and Metallurgy & Material Technology)

Time: 3 hours **Max Marks: 70**

Answer any FIVE Questions
All Questions carry equal marks
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1. Evaluate the following using $\beta - \Gamma$ functions
   (a) $\int\limits_0^1 x^7(1-x)^5 dx$
   (b) $\int\limits_0^{\pi/2} \sin^5\theta \cos^{7/2}\theta d\theta$
   (c) $\int\limits_0^{\infty} y^{-1/2}(1-e^{-y})dy$

2. (a) Prove that $1+\overset{<}{2}\ P_1(\cos\theta) + \frac{1}{3}P_2(\cos\theta) + ... = \log\left(\frac{1+\sin\frac{\theta}{2}}{\sin\frac{\theta}{2}}\right)$
   (b) Prove that $\frac{1}{2}xJ_n = (n+1)J_{n+1} - (n+3)J_{n+3} + (n+5)J_{n+5} - \frac{x}{2}J_{n+6}$

3. (a) Prove that U = $\overset{-x}{e}$ $[(x^2-y^2)\cos y + 2xy\sin y]$ is harmonic and the analytic function whose real pant is u.
   (b) Separate the real and imaginary parts of Sin h z.

4. (a) $\int\limits_c \frac{(z^2-4)\ \ dz}{z^2(z+2)^2}$ with c: $|\,z+2\,| = 1$ using Cauchy's integral formula
   (b) Evaluate $\int\limits_{-1+i}^{2+i} (x^2-y^2+i\ xy)^{dz}$ using Cauchy's integral formula along y=x$^{2.}$

5. (a) State and prove Taylor's theorem.
   (b) Find the Laurent series expansion of the function $\frac{z^2-6z-1}{(z-1)(z-3)(z+2)}$ in the region 3< |z+2| <5.

6. (a) Find the poles and residues at each pole $\frac{(2z+1)}{(z^2-z-2)}$.
   (b) Evaluate $\int\limits_C \frac{3\sin z.dz}{(z^2-\frac{\pi^2}{4})}$ where C is |z| = Π by residue theorem

7. (a) Evaluate $\int\limits_0^{\pi} \frac{a d\theta}{a^2+\sin^2\theta}$ using residue theorem.
   (b) Evaluate $\int\limits_0^{\infty} \frac{dx}{(x^4+16)}$ using residue theorem.

8. (a) If $w=z+a^2/z$. prove that when z describes the circles $x^2+y^2=a^2$, w describes a straight line and find its length.

   (b) Find the mobius transformation which maps (1, -i, 2) z-plane onto (0, 2, -i) in w-plane.

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