(DCS 221)

B. Tech. DEGREE EXAMINATION, MAY - 2015

(Examination at the end of Second Year)

COMPUTER SCIENCE

Paper - I : Mathematics - IV

Time : 3 Hours **Maximum Marks : 75**

Answer question No. 1 compulsory ***(15)***

Answer ONE question from each unit ***(4 x 15 = 60)***

1) a) Define derivative of a function $f(z)$

b) State Cauchy – Riemann equations.

c) Define harmonic function.

d) Define zero's of a function.

e) Define Removable singularity.

f) Define Poisson's integral formula.

g) Define entire function.

h) Define conjugate of a function.

i) Define Residue theorem.

j) Define pole.

k) Define frobenius method.

l) Define Rodaigue's formula.

m) Define Bessel's equation.

n) Write the expression for $p_3(x)$.

o) Write the orthogonal property of Legendre polynomial.

Unit – I

2) a) Show that the function $f(z)=\sqrt{|1xy|}$ is not analytic at the origin even through CR equations are satisfied.

b) Find the orthogonal trajectories of the family of curves $x^4+y^4-6x^2y^2=C$.

OR

3) a) Show that $f(z)=xy+iy$ is every where continuous but not analytic.

b) State and prove Riemann equation for polar coordinates.

Unit – II

4) a) Expand Taylor's series of $\frac{z-1}{z+1}$ about the point $z = 1$.

b) Compute $\oint \frac{z+4}{z^2+2z+5}\,dz$ where c is $|z+1-i|=2$.

OR

5) a) State and prove Taylor's series.

b) Find the Laurent series of $f(z)=\frac{1}{z^2(z-3)^2}$ about $z = 3$.

Unit – III

6) a) Evaluate $\int_c \frac{e^z}{\cos \pi z}\,dz$ where c is the unit circle $|z|=1$.

b) Show that $\int_0^{2\pi} \frac{\cos^2\theta}{1-2a\cos\theta+a^2}\,d\theta=\frac{2\pi a^2}{1-a^2}$ $a^2<1$

OR

7) a) Find the residue of $f(z)=\frac{z^3}{(z-1)^4(z-2)(z-3)}$ at its poles and hence evaluate $\oint_c f(z)dz$ where c is the circle $|z| = 2.5$.

b) Solve the series in equation $y''+xy'+y=0$.

Unit – IV

8) a) $J_n''(x) = \frac{1}{4} \; J_{n-2}(x) - 2J_n(x) + J_{n+2}(x)$

b) Show that $J_0(x) = \frac{1}{\Pi} \int_0^{\pi} \cos(x\cos\phi)\, d\phi$

OR

9) a) Express $f(x) = x^4 + 3x^3 - x^2 + 5x - 2$ in terms of Legendre polynomials.

b) Prove that $np_n(x) = xp_n'(x) - p_{n-1}'(x)$

⌘⌘⌘