Total No. of Questions : 05] [SET-A] [Total No. of Printed Page : 02

FINAL EXAMINATION – JULY 2017

MASTER OF SCIENCE (M.Sc. MATHEMATICS)

First Year – First Semester

Complex Analysis – I

1M.Sc. 4

Time : 3 Hours **Max Marks : 70**

Min. Marks : 25

Note :- **Solve any two parts from each question. All questions carry Equal marks.**

Q.1. (a) State and prove C-R- equation in polar form.

(b) Find an analytic function whose imaginary point is given by $tan^{-1}\left(\frac{y}{x}\right)$ and hence find the real part.

(c) Define modulus and argument of a complex no. and find it for $Z = \frac{1+2i}{1-(1-i)^2}$

Q.2. (a) Prove that $\frac{\partial(u,v)}{\partial(x,y)}\frac{\partial(x,y)}{\partial(u,v)} = 1$.

(b) Consider the transformation w = 2z and determine the region D' of the w-plane into which the triangular region D enclosed by the lines x = o, y = o, x + y =1 in the z-plane is mapped under this transformation.

(c) Find the bilinear transformation that maps the points $z_1 = \infty, z_2 = i, z_3 = 0$ into the points $w_1 = 0, w_2 = i, w_3 = \infty$.

Q.3. (a) Evaluate $\int(\bar{z})^2 dz$ around the circle $|z-1| = 1$.

(b) Evaluate $\int_c \frac{sin\,\Pi z^2 + cos\,\Pi z^2}{(z-1)(z-2)}$ dz where c: $|z|$= 3

(c) Let f (z) be analytic in a simple closed region R. Then show that the integral of f(z) along any closed curve in R is path independent.

Q.4. (a) State and prove Cauchy integral formula for simply connected region.

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(b) Using Cauchy's integral formula; calculate

$$\int_C \frac{z\,dz}{(9-z^2)(z+i)}\ ;\ c: |z| = 2$$

(c) State and prove Lioville's theorem.

Q.5. (a) State and proof Laurent's theorem.

(b) Expand f(z) = $\frac{1}{z^2-3z+2}$ for $0 < |z| < 1$

(c) Expand f(z) = sinz in a Taylor series about z = $\frac{\Pi}{4}$

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