UNIVERSITY OF THE PUNJAB
Fifth Semester – 2019
Examination: B.S. 4 Years Program

Roll No. in Fig. ....

Roll No. in Words. ....

....

PAPER: Complex Analysis-I
Course Code: MATH-303   Part–I (Compulsory)

MAX. TIME: 30 Min.
MAX. MARKS: 10

Signature of Supdt.:

Attempt this Paper on this Question Sheet only.
Please encircle the correct option. Division of marks is given in front of each question.
This Paper will be collected back after expiry of time limit mentioned above.

Question I. Circle the correct answer to each question.   1 x 10=10

1. The function $f(z) = \sin(x + iy)$ is

   (a) Analytic   (b) Not analytic   (c) Harmonic   (d) None of these

2. For any $p \in \mathbb{R}$, $Lim_{z \to 1} \dfrac{z^p - 1}{z - 1} =$

   (a) 0   (b) 1   (c) p (d) Does not exist

3. The complex conjugate $\bar{z}$ is found by _____ z across the real axis.

   (a) Translating   (b) Reflecting   (c) Magnifying   (d) None of these

4. $Log(1) =$

   (a) $i\dfrac{\pi}{2}$ (b) $\dfrac{\pi}{2}$ (c) $\dfrac{\pi}{4}$ (d) 0

5. $|e^z| =$

   (a) e^y (b) e^x (c) $e^x e^y$ (d) e^{x+y}

6. The mapping $w = e^z$ is _____ through out the entire $z-$plane.

   (a) Isogonal   (b) Conformal   (c) Linear   (d) None of these

7. A point is said to a _____ of a curve C if C passes through that point more than once.

   (a) Singular point   (b) Fixed point   (c) Multiple point   (d) None of these

8. For $C : |z| = 1$, the value of $\int_C \dfrac{dz}{z^2 - 4} =$ _____ is

   (a) 2π (b) $2\pi i$ (c) 0   (d) None of these

9. If $\alpha = 1$ in a linear transformation $w = \alpha z + \beta$ then w becomes

   (a) Rotation   (b) Magnification

   (c) Translation   (d) Möbius transformation

10. If a function f is analytic throughout a simply connected domain D then $\int_C f(z)dz = 0$ for every closed contour C lying in D.

    (a) Cauchy-Goursat theorem   (b) Morera's theorem

    (c) Liouville's theorem   (d) Cauchy inequality theorem

UNIVERSITY OF THE PUNJAB
Fifth Semester – 2019
Examination: B.S. 4 Years Program

Roll No. ....

PAPER: Complex Analysis-I
Course Code: MATH-303   Part – II

MAX. TIME: 2 Hrs. 30 Min.
MAX. MARKS: 50

ATTEMPT THIS (SUBJECTIVE) ON THE SEPARATE ANSWER SHEET PROVIDED

Question II. Write the answer of the following short questions.   5 x 4=20

1. Find the values of $(-1)^i$ and $(-i)^i$.

2. If $z = x^2 + iy$, for any $x, y \in \mathbb{R}$, find $arg(e^z)$.

3. Evaluate $\int_C \dfrac{dz}{z^2 - 1}$ where, $C : |z| = 2$.

4. Find the zeros of $\sin z$.

LONG QUESTIONS   10x3=30

Question III. Transform $|z| = 1$ under the transformation $w = \dfrac{1}{z - 1}$. Discuss the nature of the curve.

Question IV. Find radius of convergence of the series

$$a) \sum \frac{n!}{n^2} z^n \qquad\qquad b) \sum \frac{i^{n+2}}{2^n} z^n.$$

Question V. If $z = \dfrac{(1+i) + (3+2i)t}{1 + it}$ then prove that the locus of z is a circle. Also find the radius and center of the circle.