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The Open University of Sri Lanka
B.Sc/B.Ed. Degree Programme
Open Book Test (OBT) - 2017/2018
Pure Mathematics - Level 05
PEU5305 Complex Analysis I

Duration: One Hour

Date: 14.06.2018 Time: 04.15pm - 05.15pm

Answer ALL questions.

1. (a) Check whether the set $S = \{z \in \mathbb{C} : |z - 1 - i| > 1\}$ is a region or not.

   (b) By considering the sets $E_n = \left\{z \in \mathbb{C} : |z| < \frac{1}{n}\right\}$ for $n = 1, 2, 3, \ldots$, show that an arbitrary intersection of open sets need not be open.

   (c) Find boundary points, exterior points and the closure of the set $S = \{z \in \mathbb{C} : |z - 1| \leq 1\} \setminus \{0\}$

2. (a) Find the limit of the sequence $\{z_n\} = \left\{\frac{\sqrt{n} + i(n+1)}{n}\right\}$.

   (b) Show that the sequence $\{z_n\} = \{(1+i)^n\}$ diverges.

   (c) Check whether the following series are converges or diverges:

   i. $\sum_{n=1}^{\infty} \frac{1 + in(-1)^n}{n^2}$;

   ii. $\sum_{n=1}^{\infty} \frac{(n+i)(1+ni)}{n^2}$;

   iii. $\sum_{n=0}^{\infty} \left(\frac{1}{2+i}\right)^n$.

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