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The LNM Institute of Information Technology, Jaipur
Mid-Term Examination (September 2016)
Sub: Mathematics-III

Max.Marks: 14+16

Duration : 90 minutes

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Note: **Submit Part-I after 45 minutes of commencement of the exam.** Encircle/Tick the most appropriate answer for objective type questions. Overwriting will be treated as a wrong answer. Use only the last page of main answer sheet for rough work and calculation. Use only pen to write answers. Answers written by pencils will not be evaluated.

Part-I

(To be returned within 45 minutes)

1 1. Which of the following function is bounded on complex plane $\mathbb{C}$ [1 mark]
(a) $\sin z$ (b) $z^2 - i$ (c) $\cos^2 z$ ✓(d) $e^{iRe(z)}$.

1 2. The function $f(z) = Log(z) + |z|^2$ is [1 mark]
(a) Differentiable in $\mathbb{C}$ except 0 ✓(b) Differentiable nowhere
(c) Differentiable at the origin (d) Analytic at the origin.

3. Which of the following statement is true [1 mark]
1 ✓(a) Contour integral of an analytic function defined on a simply connected domain is independent of path.
(b) If $f(z)$ is analytic in a simply connected domain, then for any curve C, $\int_C f(z)dz = 0$.
(c) If $f(z)$ is analytic and non-constant function on the entire complex plane $\mathbb{C}$, then $f(z)$ can be a bounded function on $\mathbb{C}$.
(d) If $f(z)$ is any function defined n a domain D such that $\int_C f(z)dz = 0$, then $f(z)$ is analytic.

4. Which of the following statement is always true for two complex numbers z_1 and z_2 [1 mark]
1 (a) $Arg(z_1 z_2) = Arg(z_1) + Arg(z_2)$ ✓(b) $arg(\frac{z_1}{z_2}) = arg(z_1) - arg(z_2)$
(c) $Log(z_1 z_2) = Log(z_1) + Log(z_2)$ (d) $|z_1 + z_2| = |z_1| + |z_2|$

5. Which of the following statement is false for the complex numbers z [1 mark]
1 (a) $\sin iz = i \sinh z$ (b) $\cos iz = \cosh z$
✓(c) $\sin \overline{iz} = i \sinh \overline{z}$ (d) $\cos \overline{iz} = \cosh \overline{z}$

6. The value of contour integral $\oint_C \frac{e^z}{z^2+1} dz$ is, where $C : |z + \pi| = 2$ [1 mark]
1 (a) $\frac{-ie^{-i}}{2}$ (b) $\frac{ie^{-i}}{2}$ (c) $\frac{-ie^{i}}{2}$ ✓(d) 0.

2 7. The principle value of $(-1-i)^{3i}$ is $e^{9\pi/4} \cdot \left[\cos\left(\frac{3\log 2}{2}\right) + i \sin\left(\frac{3\log 2}{2}\right)\right]$ [2 mark]

2 8. The zeroes of the function $\sin(i2z - 1)$ are $[(n\pi - 1)i] \div 2 = \frac{(n\pi - 1)i}{2}$ [2 mark]

2 9. The value of $\oint_C \frac{\sin z}{z(z-5)} dz$ where $C : |z - 1| = 2$ is 0 [2 mark]

0 10. The sufficient conditions for the function $f(z) = u(x, y) + iv(x, y)$ to be differentiable at the point z_0 are/is [2 mark]
U_x, U_y, V_x, V_y are continuous

C-R eq: ?