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JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST-3 EXAMINATION- JUNE -2016

B. Tech (CE) II Semester

COURSE CODE: 10B11MA201 **MAX. MARKS: 35**

COURSE NAME: MATHEMATICS-II

COURSE CREDITS: 04 **MAX. TIME: 2 HRS**

Note: All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means. The use of any calculator is not permitted in the examination.

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1. **Show that $|z|^2$ is differentiable at $z = 0$ but not analytic there.** [3]

2. **Determine the analytic function $f(z) = u + iv$, where $u = x(1 - y)$.** [3]

3. **Integrate $\int_C (z + 2\bar{z})dz$ from $z = 0$ to $z = 1 + i$ along the curve**

$$x = t,\ y = t^2, 0 \le t \le 1.$$ [3]

4. **Evaluate the contour integral $\int_C \frac{cos\pi z^2}{(z-1)(z-2)} dz$, where C is the circle $|z| = 3$ ccw.** [4]

5. **Expand the function $f(z) = \frac{1}{(z+1)(z+3)}$ in the Laurent series valid for**

$$0 < |z + 1| < 2.$$ [4]

6. **Let $f(z) = \frac{z-1}{(z+1)^2(z-2)}$. Find the residue of $f(z)$ at $z = -1$, and hence use residue theorem to evaluate $\int_C f(z)dz$, where C is the circle $|z - i| = 2$ ccw.** [4]

7. **Evaluate the real integral $\int_0^{2\pi} \frac{d\theta}{5+4sin\theta}$.** [4]

8. **Solve the differential equation $y'' + y = 2x$ in series $\sum_{n=0}^{\infty} c_n x^n$.** [5]

9. **For Legendre polynomials show that**

$$\int_{-1}^{1} (1 - x^2) P_n'(x) P_m'(x) dx = \begin{cases} 0 & if \quad m \neq n \\ \frac{2n(n+1)}{(2n+1)} & if \quad m = n \end{cases}.$$ [5]