Code: 9ABS302 **R09**

B.Tech II Year I Semester (R09) Supplementary Examinations June 2016

MATHEMATICS – III

(Common to EEE, EIE, E.Con.E, ECE & ECC)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

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1 (a) Show that $\Gamma(n) = \int_0^1 \left(log\frac{1}{x}\right)^{n-1} dx \ \ (n > 0)$.

(b) Prove that $J_{1/2}(x) = \sqrt{\frac{2}{\Pi x}}\sin x$.

2 Express $f(x) = x^4 + 3x^3 - x^2 + 5x - 2$ in terms of Legendre polynomials.

3 (a) State and prove C – R equations in polar form.

(b) Find the general value of $\log(-i)$.

4 (a) Find the analytic function whose imaginary part is $e^x(x\sin y + y\cos y)$.

(b) Show that the function $u(x, y) = e^x \cos y$ is harmonic. Determine its harmonic conjugate $v(x, y) and\ f(z) = u + i\,\vartheta$.

5 (a) State and prove Cauchy's theorem.

(b) Evaluate $\int_c \frac{\log z}{(z-1)^3}\, dz$ where $C: |z - 1| = \frac{1}{2}$, using Cauchy's integral formula.

6 (a) Expand $\log(1 - z)$ where $|z| < 1$ using Taylor series.

(b) Find Laurent series expansion of the function $f(z) = \frac{z^2 - 6z - 1}{(z-1)(z-3)(z+2)}$ in the region $3 < |z + 2| < 5$.

7 Prove that $\int_0^\infty \frac{dx}{x^6+1} = \frac{\pi}{3}$.

8 (a) State and prove Rouche's theorem.

(b) Find the bilinear transformation that maps the points $(\infty, i, 0)$ into the points $(0,\ i\ , \infty)$.

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