Code: 9ABS302

R09

B.Tech II Year I Semester (R09) Supplementary Examinations June 2017

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 $\sqrt{\pi}\,\Gamma(2m) = 2^{2m-1}\,\Gamma(m)\,\Gamma\left(m+\frac{1}{2}\right)$.

(b) Show that $\beta(m,n+1) + \beta(m+1,n) = \beta(m,n)$.

2 (a) Show that an analytic function with constant modulus is constant.

(b) If the potential function is $\log(x^2 + y^2)$, find the flux function and the complex potential function.

3 (a) Prove that $(i)^i = e^{-(4n+1)\pi/2}$.

(b) Separate $\sin^{-1}(cos\theta + i\ sin\theta)$ into real and imaginary parts, where θ is a positive acute angle.

4 (a) Evaluate $\int_{1-i}^{2+3i}(z^2+z)dz$ along the line joining the points (1, -1) and (2, 3).

(b) If $f(\xi) = \oint_c \frac{3z^2+7z+1}{z-\xi}dz$, where C is the circle $x^2 + y^2 = 4$, find the values of f(3), f'(1-i), f''(1-i).

5 (a) Expand e^z as Taylor's series about z = 1.

(b) Obtain Laurent's series for $f(z) = e^{2z/(z-1)^3}$ about z = 1.

6 (a) Use Cauchy's residue theorem to evaluate $\oint_c \frac{dz}{(z^2+4)^2}$ where c is the circle $|z-i| = 2$.

(b) Evaluate $\int_0^\infty \frac{dx}{(1+x^2)^2}$.

7 Prove that one root of the equation $z^4 + z^3 + 1 = 0$ lies in the first quadrant.

8 Find the bilinear transformation which maps the points z = 1, i, -1 on to the points w = i, 0, -i. Hence find: (i) The image of $|z| < 1$. (ii) The invariant points of this transformation.

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