

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  $\theta$  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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