

Code: 15A54402

B.Tech II Year II Semester (R15) Regular Examinations May/June 2017

MATHEMATICS – IV

(Common to EEE, ECE and EIE)

Time: 3 hours

Max. Marks: 70

PART – A
(Compulsory Question)

- 1 Answer the following: (10 X 02 = 20 Marks)
- Compute $\Gamma(3.5)$.
 - $\beta\left(\frac{9}{2}, \frac{7}{2}\right)$.
 - Compute $J_0(2)$
 - $J_0(x) = \frac{9}{2}[J_2(x) - J_0(x)]$ use recurrence relation.
 - Find the critical points of the transformation $w^2 = (z - a)(z - b)$.
 - Compute $V(r, \theta)$ when $f(z) = u(r, \theta) + iv(r, \theta)$. Here $u(r, \theta) = \left(r + \frac{1}{r}\right) \cos \theta$.
 - Expand Taylor's series $\cos z$ about the point $z = \pi/2$.
 - Write the formula of pole of order n at $z = z_0$.
 - Evaluate $\oint_C e^{1/z^2} dz$ where C is $|z| = 2$ traversed counterclockwise.
 - Evaluate $\oint_C \frac{dz}{z^2(z+4)}$ where C is $|z| = 2$.

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

- 2 State and prove relation between Beta and Gamma function.

OR

- 3 (a) Find the value of $\Gamma\left(\frac{1}{2}\right)$.
(b) Derive $\int_0^{\pi} \sin^n \theta d\theta$.

UNIT – II

- 4 Show that $J_0(x) = \frac{1}{\pi} \int_0^{\pi} \cos(x \cos \phi) d\phi$.

OR

- 5 Find the value of $J_{\frac{1}{2}}(x)$.

UNIT – III

- 6 Find the analytical function of the complex potential for an electric field $w = \phi + i\Psi$, given that $\Psi = x^2 - y^2 + \frac{x}{x^2 + y^2}$. Use Milne Thomson method.

OR

- 7 (a) Find the bilinear transformation that maps the points $z_1 = -i, z_2 = 0, z_3 = i$ into the points $w_1 = 0, w_2 = -1$ and $w_3 = \infty$.
(b) Find the fixed points of the bilinear transformation $w = (z - 1)/(z + 1)$.

UNIT – IV

- 8 Evaluate $\int_C \frac{e^{2z}}{(z+1)^4} dz$ where C is the circle $|z| = 2$, using complex integration formula.

OR

- 9 Represent the function $f(z) = \frac{4z+3}{z(z-3)(z-2)}$ as Laurent series:
(i) Within $|z| = 1$. (ii) In the annulus region $|z| = 2$ and $|z| = 3$. (iii) Exterior to $|z| = 3$.

UNIT – V

- 10 Apply the calculus of residues to evaluate $\int_0^{2\pi} \frac{d\theta}{2 - \sin \theta}$.

OR

- 11 (a) Evaluate $\int_{|z|=\frac{1}{2}} \frac{dz}{(z-1)(z+2)^2} = 0$ using Residue theorem.
(b) Evaluate $\oint_C \frac{z^2}{z^2 - jz + 2} dz$ where C is $|z| = 3/2$, traversed counterclockwise.
