

MATHEMATICS – III

(Common to EEE, ECE & EIE)

Time: 3 hours

Max. Marks: 70

PART – A

(Compulsory Question)

- 1 Answer the following: (10 X 02 = 20 Marks)
- Evaluate $\int_0^{\infty} e^{-x^{1/3}} dx$.
 - $\beta(m+1, n)/\beta(m, n) =$
 - Express $(1+x)$ in terms of Legendre polynomials.
 - $J_{n-1}(x) - J_{n+1}(x) =$
 - The analytic function whose imaginary part is $v(x, y) = 2xy$ is
 - The fixed points of the transformation $w = \frac{z-1+i}{z+2}$ are
 - If C is a simple closed curve enclosing the origin, then $\int_C \frac{e^{az}}{z^2} dz$ is
 - Define isolated singularity with one example.
 - Laurent's series expansion of $f(z) = z^2 e^{1/z}$ at $z = 0$ is
 - If $f(z) = \frac{e^z}{z^2 + \pi^2}$ then $\text{Res}\{f(z); \pi i\} =$

PART – B

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

UNIT - I

- 2 Show that $\beta(m+2, n-2) = \frac{m(m+1)}{(n-1)(n-2)} \beta(m, n)$, $m > 0, n > 0$.

(OR)

- 3 Express $\int_0^1 x^m (1-x^n)^p dx$ in terms of Gamma function and evaluate $\int_0^1 x^5 (1-x^3)^{10} dx$

UNIT - II

- 4 Prove that $\frac{d}{dn} [J_0(x)] = -J_1(x)$.

(OR)

- 5 Prove that $\int_{-1}^1 x P_n(x) P_{n-1}(x) dx = \frac{2n}{4n^2-1}$.

UNIT - III

- 6 Find the conjugate harmonic of $u = e^{x^2-y^2} \cos 2xy$. Hence find $f(z)$ in terms of z .

(OR)

- 7 Find the bilinear transformation that maps the points $2, i, -2$ onto $1, i, -1$ respectively.

UNIT - IV

- 8 Integrate $f(z) = x^2 + ixy$ from $A(1,1)$ to $B(2,8)$ along the straight line AB.

(OR)

- 9 Find the Laurent expansion $f(z) = \frac{7z-2}{(z+1)z(z-2)}$ in $1 < |z+1| < 3$.

UNIT - V

- 10 Find the residue of $\frac{z^2}{z^4-1}$ at singular points that lie inside the circle $|z| = 2$.

(OR)

- 11 Evaluate $I = \int_0^{\infty} \frac{dx}{(x^2+a^2)^2}$.
