

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