Roll No. | | | | | | | | | | | | **Total No. of Pages : 02**

Total No. of Questions : 09

B.Tech.(Instrumentation & Control Engg.) (Sem.–3)

APPLIED MATHEMATICS – III

Subject Code : AM-201

M.Code : 54501

Time : 3 Hrs. **Max. Marks : 60**

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION–A

1. Write briefly :

a) Evaluate, $\oint_C \frac{e^z}{\cos \pi z} dz$ along the circle C : $|z| = 1$.

b) Find L $(\sin^2 3t)$.

c) Solve $(x^2 - yz)\, p + (y^2 - zx)\, q = z^2 - xy$.

d) Show that an analytic function with constant modulus is constant.

e) Write half range sine series of the function $f(x) = x$ in the interval $0 < x < 2$.

f) Write the sufficient conditions for the existence of Laplace transform.

g) Find solution of homogeneous partial differential equation $4r - 12s + 9t = 0$.

h) Show that $nP_n(x) = xP_n'(x) - P_{n-1}'(x)$.

i) If $f(x)$ is an odd function in $(-l, l)$, then what are the values of a_0 and a_n?

j) Find the bilinear transformation that map the points $z = 1, i, -1$ into the points $w = i, 0, -i$.

SECTION–B

2. Find a Fourier series to represent e^{-x} from $x = -l$ to $x = l$.

3. A tightly stretched string with fixed end points $x = 0$ and $x = 1$ is initially in a position given by $y = y_0 \sin^3 (\pi x)$. If it is released from rest from this position, find the displacement $y (x, t)$.

4. Show that function $f(z)$ defined by $f(z) = \dfrac{x^2 y^3 (x+iy)}{x^6 + y^{10}}, z \neq 0, f(0) = 0$, is not analytic at the origin even though it satisfies Cauchy-Riemann equations.

5. Evaluate $\int_0^\infty \dfrac{e^{-2t\sin^2 t}}{t} dt$.

6. Show that $J_{\frac{5}{2}}(x) = \sqrt{\dfrac{2}{\pi x}}\left[\dfrac{1}{x^2}(3-x^2)\sin x - \dfrac{3}{x}\cos x\right]$.

SECTION–C

7. Use the concept of residues to evaluate $\int_0^{2\pi} \dfrac{dx}{(5-4\sin x)}$.

8. Solve the equation using Laplace transformation :

$$\frac{d^2x}{dt^2} + 2\frac{dx}{dt} + 5x = e^{-t}\sin t,\ x(0) = 0,\ x'(0) = 1$$

9. Find the power series solution about the origin of the equation :

$$(1 - x^2)\, y'' - 2xy' + 6y = 0.$$

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.