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

Total No. of Questions : 09

B.Tech.(BME/ECE/EE/EEE/EIE/Textile)   **(Sem.–3)**

APPLIED MATHEMATICS – III /
ENGINEERING MATHEMATICS

Subject Code : AM-201
Paper ID : [A0303]

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) State the conditions under which a function $f(x)$ can be developed as a Fourier series.

    b) Write the half range sine series for 1 in $(0, \pi)$.

    c) Evalaute $\int_{0}^{\infty} \frac{\sin t}{t} dt$.

    d) State the first shifting property for the laplace transforms.

    e) Write the expansions for $J_0(x)$ and $J_1(x)$

    f) Solve $p + q = 0$.

    g) Explain how to solve $f(z, p, q) = 0$.

    h) Evaluate $\int_{c} \frac{dz}{z-a}$ where C is the circle $|z - a| = r$, a constant.

    i) State the Laurent's Theorem.

    j) Define a pole.

SECTION-B

2. Obtain the Fourier series for the function $f(x)$ given by

$$f(x) = 1 + \frac{2x}{\pi}, \quad -\pi \le x \le 0$$

$$= 1 - \frac{2x}{\pi}, \quad 0 \le x \le \pi$$

Deduce that, $\dfrac{1}{1^2} + \dfrac{1}{3^2} + \dfrac{1}{5^2} + ... \dfrac{\pi^2}{8}$.

3. Find : $L^{-1}\left\{\log \dfrac{s+1}{s-1}\right\}$.

4. With usual notations, prove that $\dfrac{d}{dx}[x^{-n}J_n(x)] = -x^{-n}J_{n+1}(x)$.

5. Solve : $z^2(p^2 + q^2) = x^2 + y^2$.

6. Find an analytic function $f(z) = u + iv$ given that,

$$u + v = \frac{\sin 2x}{\cosh 2y - \cos 2x}$$

SECTION-C

7. Solve : $\dfrac{d^2 y}{dt^2} + 9x = \cos 2t$, if $x(0) = 1$, $x\left(\dfrac{\pi}{2}\right) = -1$.

8. A tightly stretched string of length l with fixed ends is initially in equilibrium position. It is set vibrating by giving each point a velocity $v_0 \sin^3 \dfrac{\pi x}{l}$. Find the displacement $y(x, t)$.

9. Prove that $\displaystyle\int_0^\pi \frac{a d\theta}{a^2 + \sin^2 \theta} = \frac{\pi}{\sqrt{1 + a^2}}$, $a > 0$.