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. Are Cauchy Reimann equations satisfied at $z = 0$ for the function $f(z) = \begin{cases} \dfrac{x^3(1+i) - y^3(1-i)}{x^2+y^2}; & z \neq 0 \\ 0\,; & z = 0 \end{cases}$

b. State convolution theorem.

c. Check the continuity of the function $f(z) = \begin{cases} \dfrac{xy}{x^2+y^2}; & z \neq 0 \\ 0\,; & z = 0 \end{cases}$ at $z = 0$.

d. Write down the one dimensional heat equation.

e. Define an odd function. What is the value of a_0 and a_n in the Fourier series expansion of an odd function defined in the interval (–1,1).

f. State and prove first shift property of Laplace transforms.

g. State Cauchy Reimann Equations in polar form.

h. Is the function $x^2 - y^2 - y$ harmonic?

i. Evaluate $L^{-1}\left(\dfrac{1}{(s)^{\frac{9}{2}}}\right)$.

j. Evaluate $L\begin{Bmatrix} t+2\,;0<t<4 \\ 5; \qquad t>4 \end{Bmatrix}$

SECTION-B

2. Evaluate $\oint_c \dfrac{2z^3+z^2+4}{z^4+4z^2}$ where c is the circle $|z-2|=4$, clockwise.

3. Show that $\int_0^\infty e^{-3t}\, t \cos t\, dt = \dfrac{2}{25}$ using Laplace transform.

4. Solve the differential equation

$$\frac{d^3y}{dx^3}+y=1;\ \text{given that } y(0)=y'(0)=y''(0)=0$$

5. If $u-v=(x+y)(x^2+4xy+y^2)$ and $f(z)=u+iv$ is an analytic function, find the function $f(z)$ in terms of z.

6. Solve the equation $xp+yq=3z$

SECTION-C

7. Prove that the Fourier series expansion for the function $f(x) = \dfrac{1}{2}(\pi-x), 0\le x\le 2\pi$ is given by $\sum_{n=1}^{\infty}\dfrac{\sin nx}{n}$

Hence deduce that $\dfrac{\pi}{4}=1-\dfrac{1}{3}+\dfrac{1}{5}-\dfrac{1}{7}+.....$

8. Solve the differential equation $x^2y''+xy'+(x^2-n^2)y=0$ and hence obtain the Bessel's function.

9. A string of length L is stretched and fastened to two fixed points. Find the solution of the wave equation $y_{tt}=a^2y_{xx}$ when initial displacement $y(x,0)=f(x)=b\sin\dfrac{\pi x}{L}$.