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

Total No. of Questions : 09

B.Tech.(Automation & Robotics) (2018 Batch) (Sem.–3)

MATHEMATICS-III

Subject Code : BTAR-303-18

M.Code : 76502

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) Explain the Dirichlet conditions for a function to be expressed in terms of Fourier series.

b) Find Laplace Transform of $e^{-t}\cos^2 t$

c) Find Laplace Inverse Laplace transform of $\frac{1}{s^2+s+1}$.

d) Define ordinary point and regular singular point.

e) Express $f(x) = x^2 + 2x + 1$ in terms of Lagendre function.

f) Form a partial differential equation from $f(x^2 + y^2, z - xy) = 0$.

g) Solve the partial differential equation $yz\frac{\partial z}{\partial x} + xz\frac{\partial z}{\partial y} = xy$.

h) Evaluate $\int_C \frac{z-3}{z^2+2z+5},, C:|z|=2.$

i) Show that sin z is analytic function

j) Define even function and write fourier series for an even function in the interval (–c, c), provided it satisfies all the conditions.

SECTION-B

2. Find the Fourier series for $f(x)$ in the interval $(-\pi, \pi)$ when $f(x) = \begin{cases} \pi + x, & -\pi < x < 0 \\ \pi - x, & 0 < x < \pi \end{cases}$.

3. Solve the differential equation using Method of Laplace transform

$$\frac{d^2y}{dt^2} + 4\frac{dy}{dt} + 5y = \sin 5t,\ y(0) = 0,\ y'(0) = 0$$

4. Prove that $\frac{d}{dx}[x^n J_n(x)] = x^n J_{n-1}(x)$

5. Expand $f(z) = \frac{1}{(z+1)(z+3)}$ in Laurents series, valid for (i) $1 < |z| < 3$

6. Solve the Partial differential equation

$$\frac{\partial^2 z}{\partial x^2} - \frac{\partial^2 z}{\partial x \partial y} - 6\frac{\partial^2 z}{\partial y^2} = x + y$$

SECTION-C

7. a) Find half-range cosine series for $f(x) = x$ in the interval $[0, \pi]$

   b) Define Unit step function and find its Laplace transform.

8. Evaluate $\int_0^\infty \frac{\cos x}{x} dx$ by contour integration.

9. A homogeneous conducting rod of length 100 cm has its ends kept at zero temperature and temperature initially is

$$u(x,0) = \begin{cases} x & 0 \le x < 50 \\ 100 - x, & 50 \le x \le 100 \end{cases}$$

Find the temperature $u(x, t)$ at any time t.

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.