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

Total No. of Questions : 09

B.Tech.(Automation & Robotics) (2011 & Onwards) (Sem.–3)

MATHEMATICS – III

Subject Code : BTAR-301

M.Code : 63001

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) What is the laplace transform of unit impulse function?

b) Find Laplace transform of $\frac{e^{-t}\sin t}{t}$

c) Find the inverse Laplace Transform of $\left(\log\frac{s+1}{s-1}\right)$

d) Show that $P_n(1) = 1$

e) Prove that $J_n(x) = \frac{x}{2n}[J_{n-1}(x) + J_{n+1}(x)]$

f) Define analytic function.

g) Show that the transformation $w = \frac{2z+3}{z-4}$ maps the circle $x^2 + y^2 - 4x = 0$ into straight line $4u + 3 = 0$

h) For conformal transformation $w = z^2$ prove that angle of rotation at $z = 1 + i$ is $\pi/4$.

i) Find the nature and location of singularities of $\frac{z-\sin z}{z^2}$

j) Find the sum of residues of $f(z) = \frac{\sin z}{z\cos z}$ at its poles inside the circle $|z| = 2$.

SECTION–B

2. Evaluate $L\left(\sqrt{t}-\frac{1}{\sqrt{t}}\right)^3$

3. Find the inverse Laplace transform of $\frac{5s+3}{(s-1)(s^2+2s+5)}$

4. Solve in series the equation

$$9x\,(1-x)y'' - 12y' + 4y = 0$$

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

6. Verify Cauchy's theorem by integrating e^{iz} along the boundary of triangle with the vertices at the points $1 + i$, $-1 + i$, $-1 - i$.

SECTION–C

7. Define Harmonic function. Show that the function

$$u = e^{-2xy}\sin(x^2 - y^2)$$

is harmonic. Find the conjugate function v and express $u + iv$ as an analytic function of z.

8. Obtain the Fourier series for $f(x) = \begin{cases} \pi x, & 0 \le x \le 1 \\ \pi(2-x), & 1 \le x \le 2 \end{cases}$

9. Expand $\frac{1}{[(z-1)(z-2)]}$ in region

$|z| < 1$, $1 < |z| < 2$, $|z| > 2$, $0 < |z-1| < 1$

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.