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

Total No. of Questions : 18

B.Tech. (Automation & Robotics) (2012 & Onward) (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. If Laplace transform of $f(t)$ is F(s) then find Laplace Transform $L\left(\int_0^t f(t)\,dt\right)$, if it exists.

2. Find Inverse Laplace Transform of $\frac{2s+6}{s^2+4}$.

3. Write down the Bessel's differential equation of order 'n'.

4. Define error function.

5. Express the following in terms of Lagendre polynomials $1 - x + x^2$

6. Show that cosz is an analytic function.

7. Define a conformal mapping.

8. Evaluate $\int_C \frac{1+z^2}{z-2} dz,, C : |z| = 3$

9. Evaluate the integral $\int_0^{3+i} z^2 dz$ along the line $y = x/3$

10. Expand $\log(1 + z)$ about $z = 0$.

SECTION-B

11. Solve the differential equation using Method of Laplace transform

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

12. Prove that $(2n + 1)\, xP_n(x) = (n + 1)\, P_{n+1}(x) + nP_{n-1}(x)$

13. Show that the function defined by $f(z) = \begin{cases} \dfrac{x^2y^3(x+iy)}{x^6+y^{10}} & z = 0 \\ 0, & z \neq 0 \end{cases}$, is analytic at origin, even though $f'(0)$ does not exist.

14. If the potential function is $\log(x^2 + y^2)$, find the flux function and complex potential function.

15. Show that the transformation $w = \dfrac{z-i}{z+i}$ maps the real axis in the z-plane onto the circle $|w| = 1$.

SECTION-C

16. (a) Define unit step function and find its Laplace transform.

(b) Prove that $\dfrac{d}{dx}[x^{-n}J_n(x)] = -x^{-n}J_{n+1}(x)$

17. Solve by applying Frobenius method : $9x(1-x)\dfrac{d^2y}{dx^2} - 12\dfrac{dy}{dx} + 4y = 0$

18. Using Contour integration, evaluate the integral $\int_0^\infty \dfrac{dx}{x^4+1}$

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