Roll No. [ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ] **Total No. of Pages : 02**

Total No. of Questions : 09

B.Tech.(Automation & Robotics) (2012 & 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) Find Laplace Transform of $e^{-t}(t+2)^2$

b) Find Inverse Laplace Transform of $\frac{e^{-s}s}{2s^2+18}$

c) Define a singular point and regular singular point.

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

e) Show that $|z|^2$ is not analytic at any point.

f) Define error function.

g) Define a conformal mapping.

h) Evaluate $\int_C \frac{e^z}{z-2} dz, C:|z|=1$.

i) Define poles and find the same for $\frac{z+1}{z^2(z-2)}$

j) Show that sinh z is analytic function.

SECTION-B

2. Solve the differential equation using Method of Laplace transform

$$\frac{d^2y}{dt^2}+4\frac{dy}{dt}+3y=e^{-3t},\ y(0)=1,\ y'(0)=1$$

3. Prove that $P_n'(x) = xP'_{n-1}(x) + nP_{n-1}(x)$

4. Find the real part of the analytic function whose imaginary part is $\tan^{-1}(y/x)$. Also find the analytic function.

5. Expand $f(z)=\dfrac{1}{(z+1)(z+3)}$ in Laurent's series, valid for $|z|>3$

6. Find the image of $w=\dfrac{1}{z}$ under the mapping $|z-3|=5$

SECTION-C

7. a) Define unit impulse function and find its Laplace transform

   b) Prove that $J_{-1/2}(x)=\sqrt{\dfrac{2}{\pi x}}\sin x$

8. Solve in series : $x\dfrac{d^2y}{dx^2}+(1+x)\dfrac{dy}{dx}+2y=0$

9. Evaluate $\displaystyle\int_0^{2\pi}\frac{d\theta}{1-2a\cos\theta+a^2}$, $0<a<1$ using Contour integration.

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.