$\square$ Total No. of Pages : 02
Total No. of Questions: 09

# B.Tech. (Petroleum Refinery Engineering) (2013 Onwards) (Sem.-3) ENGINEERING MATHEMATICS-III <br> Subject Code : BTAM-201 <br> M.Code: 72158 

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) $\operatorname{Can} f(x)=\sin (1 / x),-\pi \leq x \leq \pi$ be expanded in Fourier series?
b) Find the Laplace transform of $f(t)=(\sin t \mathrm{C} \cos t)^{2}$.
c) Give the Laplace transform of Unit Impulse function.
d) Find the Laplace inverse of $\frac{s^{43}}{s^{2}+6 s+13}$.
e) Find the singular point of the differential equation $P_{0}(x) y^{\prime \prime}+P_{1}(x) y^{\prime}+P_{2}(x) y=0$.
f) Formulate the PDE from : $z=a x+a^{2} y^{2}+b$.
g) Solve the PDE: $\frac{\partial^{3} z}{\partial x^{2} \partial y}=\cos (2 x+3 y)$.
h) Find the poles of : $f(z)=\frac{1}{(z-1)(z-2)}$.
i) Show that the function $u=e^{-x}(x \sin y-y \cos x)$ is harmonic.
j) Find the residue of $f(z)=\frac{z^{2}-2 z}{z^{2}+4}$ at its poles.

## SECTION-B

2. Find Fourier series expansion of $f(x)=x^{2},-\pi<x<\pi$. Hence deduce $\sum_{n=1}^{\infty} \frac{1}{n^{2}}$.
3. a) Evaluate $\mathrm{L}\left\{e^{-2 t} t \cos t\right\}$.
b) Find Laplace inverse of $\log \left(\frac{1+s}{s}\right)$.
4. Find the power series solution of the differential equation $\left(1-x^{2}\right) y^{\prime \prime}-2 x y^{\prime}+2 y=0$ about $x=0$.
5. Solve the PDE: $\left(x^{2}-y^{2}-z^{2}\right) p+2 x y q=2 x z$.
6. Find analytic function, whose real part is $u=\frac{\cos x}{\cosh 2 y-\cos 2 x}$.

## SECTION-C

7. a) Using Laplace transform, solve $y^{\prime \prime}+2 y-3 y=\sin t$, given that $y(0)=y^{\prime}(0)=0$.
b) Expand $f(x)=\left\{\begin{array}{rr}x, & 0<x<\frac{\pi}{2} \\ \pi-x, & \frac{\pi}{2}<x<\pi\end{array}\right.$, as a half range sine series.
8. a) Solve the PDE: $(m z-n y) p+(n x-l z) q=l y-m x$.
b) Find the image of the $w$-plane of the circle $|z-3|=2$ in the $z$-plane.
9. Solve the equation $\frac{\partial u}{\partial t}=\frac{\partial^{2} u}{\partial x^{2}}$ subject to the conditions $u(x, 0)=3 \sin n x, u(0, t)=0$ and $u(l, t)=0$, where $0<x<l, t>0$.

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.

