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

Total No. of Questions : 09

B.Tech. (Petroleum Refinery Engineering) (2013 Onwards) (Sem.–3)

ENGINEERING MATHEMATICS-III

Subject Code : BTAM-201

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) Can $f(x) = \sin(1/x)$, $-\pi \le x \le \pi$ be expanded in Fourier series?

b) Find the Laplace transform of $f(t) = (\sin t - \cos t)^2$.

c) Give the Laplace transform of Unit Impulse function.

d) Find the Laplace inverse of $\frac{s+3}{s^2+6s+13}$.

e) Find the singular point of the differential equation $P_0(x)\,y'' + P_1(x)\,y' + P_2(x)y = 0$.

f) Formulate the PDE from : $z = ax + a^2y^2 + b$.

g) Solve the PDE: $\frac{\partial^3 z}{\partial x^2 \partial y} = \cos(2x+3y)$.

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 $f(z) = \frac{z^2-2z}{z^2+4}$ 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 L $\{e^{-2t} t \cos t\}$.

   b) Find Laplace inverse of $\log\left(\frac{1+s}{s}\right)$.

4. Find the power series solution of the differential equation $(1 - x^2)y'' - 2xy' + 2y = 0$ about $x = 0$.

5. Solve the PDE: $(x^2 - y^2 - z^2)\, p + 2xyq = 2xz$.

6. Find analytic function, whose real part is $u = \frac{\cos x}{\cosh 2y - \cos 2x}$.

SECTION-C

7. a) Using Laplace transform, solve $y'' + 2y - 3y = \sin t$, given that $y(0) = y'(0) = 0$.

   b) Expand $f(x) = \begin{cases} x, & 0 < x < \frac{\pi}{2} \\ \pi - x, & \frac{\pi}{2} < x < \pi \end{cases}$, as a half range sine series.

8. a) Solve the PDE: $(mz - ny)\, p + (nx - lz)\, q = ly - mx$.

   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 $u(x, 0) = 3 \sin nx$, $u(0, t) = 0$ 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.