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Roll No.	Total No. of	Pages : 02
Total No. of Questions:09		
B.Tech. (Petroleum Refinery Engineering) (2013 ENGINEERING MATHEMATIC Subject Code : BTAM-201 M.Code : 72158	Onwards) CS-III	(Sem.–3)
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.



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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.