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Total No. of Pages : 02

Total No. of Questions : 09

B.Tech. (EE) PT (Sem.–1)

ENGINEERING MATH-III

Subject Code : BTAM-301

M.Code : 70970

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 & C. have FOUR questions each.
3. Attempt ANY FIVE questions from SECTION B & C carrying EIGHT marks each.
4. Select atleast TWO questions from SECTION - B & C.

SECTION-A

1. Solve the following :

a) Find half range cosine series for x in $(0, \pi)$.

b) State Dirichlet's condition for expansion of a function in terms of Fourier Series.

c) If L (f(t)) = F(s) then prove that L (f(at) = F(s/a)/a.

d) Find laplace transform of $e^{-2t} \sin^2 t$.

e) Find the solution of $\frac{d^2y}{dx^2} - \frac{1}{x}\frac{dy}{dx} + \left(3 - \frac{1}{4x^2}\right)y = 0$ in terms of Bessel's function

f) Define regular singular and irregular point of a second order Linear differential equation.

g) Form the Partial Differential Equation corresponding to $z = y^2 + 2f\left(\frac{1}{x} + \log y\right)$

h) Solve the partial differential equation $(z - y)\,p + (x - z)\,q = y - x$,

where $p = \frac{\partial z}{\partial x}, q = \frac{\partial z}{\partial y}$

i) Is the function $u = 2xy + 3xy^2 - 2y^3$ harmonic? Given reason.

j) Find the poles and residue at the poles of $\frac{z}{\cos z}$.

SECTION-B

2. Find Fourier series for $f(x) = |\sin x|, -\pi \le x \le \pi$.

3. State and prove second shifting theorem and hence find inverse Laplace transform of $\left(\frac{e^{-2s}s}{(s^2+s+1)}\right)$

4. Solve the homogeneous partial differential equation

$$\frac{\partial^2 z}{\partial x^2} - 4\frac{\partial^2 z}{\partial x \partial y} + 4\frac{\partial^2 z}{\partial y^2} = 4\sin(2x+y).$$

5. Prove that $J_{1/2}(x) = \sqrt{\frac{2}{\pi x}}\left(\frac{\sin x}{x} - \cos x\right)$

SECTION-C

6. If $f(z) = u + iv$ is an analytic function. Find $f(z)$ if $u + v = \frac{x}{x^2+y^2}, f(1) = 1$

7. Find series solution of the differential equation

$$9x(1-x)\frac{d^2y}{dx^2} - 12\frac{dy}{dx} + 4y = 0.$$

8. A tightly stretched elastic string with fixed end points $x = 0$ and $x = l$ is initially in a position given by $y = y_0 \sin^3\left(\frac{\pi x}{l}\right)$. If it is released from rest from this position find the displacement $y(x, t)$.

9. a) Using Residue theorem, evaluate the integral

$\int_C \frac{(z+3)}{(z+1)^2(z-2)}$, where C is the circle $|z| = 3$

b) Prove that $w = \frac{z}{i-z}$ maps the upper half of the z-plane into the upper half of w-plane.

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.