CIVIL / MECH



- S.E. Civil III CBGS AM - 111

20.11.15 OP Code: 5052

(3 Hours)

| Total Marks :80

8

N.B.: (1) Question no. 1 is compulsory.

- (2) Answer any three from remaining
- (3) Figures to the right indicate full marks.
- 1. (a) Find Laplace transform of tsin3t.
 - (b) Find half range sine series in $(0,\pi)$ for $x(\pi-x)$
 - (c) Find the image of the rectangular region bounded by x = 0, x = 3, y = 0, y = 2 under the transformation $\omega = z + (1+i)$
 - (d) Evaluate $\int f(z)dz$ along the parabola $y = 2x^2$, z = 0 to z = 3 + 18iwhere $f(z) = x^2 - 2iy$
- (a) Find two Laurent's series of $f(z) = \frac{1}{z^2(z-1)(z+2)}$ about z=0 for 8
 - (ii) |<|z|<2

 - (b) Find complex form of Fourier series for $f(x) = \cos h2x + \sin h2x$ in (-2, 2) 6 (c) Find bilinear transformation that maps 0, 1, ∞ of the z plane into -5, -1, 3 of 6 ω plane.
- (a) Solve by using Laplace transform 3. $(D^2 + 2D + 5)y = e^{-t}$ sint when y(0) = 0 and y'(0) = 1
 - (b) Solve $\frac{\partial^2 u}{\partial x^2} 2 \frac{\partial u}{\partial t} = 0$ by Bender schmidt method given - 6
 - u(0, t) = 0, u(4, t) = 0, u(x, 0) = x(4 x)
 - (c) Expand $f(x) = (x x^2) 0 < x < 1$ in a half range cosine series.
- 8 (a) Evaluate

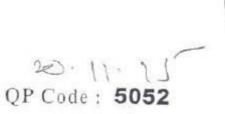
 - Using Crank Nicholoson method solve

$$\frac{\partial^2 u}{\partial x^2} - \frac{\partial u}{\partial t} = 0$$

$$u(0, t) = 0, \ u(4, t) = 0$$

$$u(x, 0) = \frac{x}{3} \ (16 - x^2)$$
Find u_i for $i = 0, 1, 2, 3, 4$ and $j = 0, 1, 2$.

[TURN OVER





$$\frac{\sin 2x}{\cosh 2y + \cos 2x}$$

(b) Find (i)
$$L^{-1} \left[\frac{e^{-\pi s}}{\epsilon^2 - 2s + 2} \right]$$

(ii)
$$L^{-1} \left[\tan^{-1} \left(\frac{s+a}{b} \right) \right]$$

- (c) Find the solution of one dimensional heat equation $\frac{\partial \mathbf{u}}{\partial t} = \mathbf{e}^2 \frac{\partial^2 \mathbf{u}}{\partial x^2}$ under the boundary conditions $\mathbf{u}(0,t) = 0$ $\mathbf{u}(1,t) = 0$ and $\mathbf{u}(x,0) = x$ $0 < x < \ell$, ℓ being length of the rod.
- 6. (a) A string is stretched and fastened to two points distance ℓ apart. Motion is started by displacing the string in the form $y = a \sin \left(\frac{\pi x}{\ell} \right)$ which it is released at time t = 0. Show that the displacement of a point at a distance x from one end at time t is given by $y_{(x,t)} = a \sin \left(\frac{\pi x}{\ell} \right) \cos \left(\frac{\pi ct}{\ell} \right)$.
 - (b) Find the residue of $\frac{\sin \pi z^2 + \cos \pi z^2}{(z-1)(z-2)^2}$ at its poles.
 - (c) Find Fourier series of Acosx in $(-\pi, \pi)$