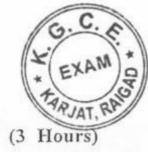
SEISETH AM MELLA Bred / Applied maths / 20113/2018 MECH & PROD



CBGO

QP Code: 5052

[Total Marks :80

5

5

6

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 + 18i 5 where $f(z) = x^2$ -2iy
- 2. (a) Find two Laurent's series of $f(z) = \frac{1}{z^2(z-1)(z+2)}$ about z = 0 for 8
 - (i) |z| < 1
- (ii) | < | z | < 2
- (b) Find complex form of Fourier series for $f(x) = \cos h2x + \sin h2x$ in (-2, 2)
- (c) Find bilinear transformation that maps 0, 1, ω of the z plane into -5, -1, 3 of 6 ω plane.
- 3. (a) Solve by using Laplace transform $(D^2 + 2D + 5)y = e^{-t} \text{ sint when } y(0) = 0 \text{ and } y^1(0) = 1$
 - (b) Solve $\frac{\partial^2 \mathbf{u}}{\partial \mathbf{x}^2} 2 \frac{\partial \mathbf{u}}{\partial \mathbf{t}} = 0$ by Bender schmidt method given
 - u(0, t) = 0, u(4, t) = 0, u(x, 0) = x(4 x)(c) Expand $f(x) = \ell x - x^2$ 0 < x < 1 in a half range cosine series.
- 4. (a) Evaluate $\int_{0}^{2\pi} \frac{d\theta}{(2 + \cos \theta)^{2}}$
 - (b) Evaluate $\int_{t}^{\infty} \frac{\cos 2t \sin 3t}{t} dt$
 - (c) Using Crank Nicholoson method solve

$$\frac{\partial^{3} u}{\partial x^{2}} - \frac{\partial u}{\partial t} = 0$$

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

$$u(x, 0) = \frac{x}{3} (16 - x^2)$$

Find u_{ij} for i = 0, 1, 2, 3, 4 and j = 0, 1, 2.

[TURN OVER

MD-Con. 7523-15.

5. (a) Find analytic function whose real part is

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

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

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

- (c) Find the solution of one dimensional heat equation $\frac{\partial \mathbf{u}}{\partial t} = \mathbf{c}^2 \frac{\partial^2 \mathbf{v}}{\partial x^2}$ under the boundary conditions $\mathbf{u}(0,t) = 0$ $\mathbf{u}(1,t) = 0 \text{ and } \mathbf{u}(x,0) = x$ $0 < x < \ell, \quad \ell \text{ being length of the rod.}$
- 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 $y_{(x,0)} = a \sin \left(\frac{\pi x}{\ell}\right) \cos \left(\frac{\pi ct}{\ell}\right)$.
 - (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 xcosx in $(-\pi, \pi)$