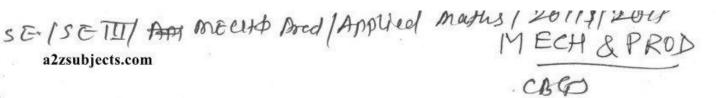
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QP Code: 5052

Total Marks:80 (3 Hours)

- N.B.: (1) Question no. 1 is compulsory.
 - (2) Answer any three from remaining.
 - (3) Figures to the right indicate full marks.
- (a) Find Laplace transform of tsin3t.

(b) Find half range sine series in $(0,\pi)$ for $x(\pi-x)$

5

- (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 + 18i5 where $f(z) = x^2 - 2iy$
- (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)
- (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

8

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- $(D^2 + 2D + 5)y = e^{-t}$ sint when y(0) = 0 and y(0) = 1
- (b) Solve $\frac{\partial^2 \mathbf{u}}{\partial \mathbf{v}^2} 2 \frac{\partial \mathbf{u}}{\partial \mathbf{t}} = 0$ by Bender schmidt method given . 6
 - u(0, t) = 0, u(4, t) = 0, u(x, 0) = x(4 x)

- (c) Expand $f(x) = \ell x x^2$ 0 < x < 1 in a half range cosine series.
- (a) Evaluate $\int_{0}^{\pi} \frac{d\theta}{(2 + \cos \theta)^{2}}$

6

8

(b) Evaluate $\int_{0}^{\infty} e^{-2t} \frac{\cos 2t \sin 3t}{t} dt$

(c) Using Crank Nicholoson method solve

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

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

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

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

TURN OVER

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(a) Find analytic function whose real part is

8

$$\sin 2x$$

 $\cosh 2y + \cos 2x$

6

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

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

- (c) Find the solution of one dimensional heat equation $\frac{\partial \mathbf{u}}{\partial t} = \mathbf{c}^2 \frac{\partial^2 \mathbf{u}}{\partial \mathbf{v}^2}$ under the boundary conditions u(0,t) = 0u(1, t) = 0 and u(x, 0) = x $0 < x < \ell$, ℓ being length of the rod.
- 8
- (a) A string is stretched and fastened to two points distance & 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 $y_{(x,t)} = a \sin\left(\frac{\pi x}{\ell}\right) \cos\left(\frac{\pi ct}{\ell}\right)$
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- (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 $(-\pi, \pi)$