Code No.: MA304BS | R20 | H.T.No. | | | 8 | R | | | | | |

CMR ENGINEERING COLLEGE: : HYDERABAD
UGC AUTONOMOUS
II–B.TECH–I–Semester End Examinations (Supply)- June- 2022
LAPLACE TRANSFORMS, NUMERICAL METHODS & COMPLEX VARIABLES
(ECE)

[Time: 3 Hours] **[Max. Marks: 70]**

Note: 1. Answer *any FIVE questions. Each question carries 14 marks.*
2. *All questions carry equal marks.*
3. *Illustrate your answers with NEAT sketches wherever necessary.*

5X14=70

1. a) Using Laplace transform, evaluate $\int_0^\infty \frac{e^{-at}\sin^2 t}{t}dt$. [7M]

   b) Using convolution theorem of Laplace transform evaluate $L^{-1}\left\{\frac{s^2}{(s^2+a^2)(s^2+b^2)}\right\}$. [7M]

2. a) Find a real root of the equation $xe^x - \cos x = 0$ using Newton-Raphson's method. [7M]

   b) Using Newton's Forward Interpolation, compute the value of $e^{1.75}$, given that $e^{1.7} = 5.474$, $e^{1.8} = 6.050$, $e^{1.9} = 6.686$ and $e^{2.0} = 7.389$. [7M]

3. a) Evaluate $\int_0^6 \frac{1}{1+x}dx$ using Simpson's $\frac{3}{8}^{th}$ rule by taking into 6 sub intervals. [7M]

   b) Solve $\frac{dy}{dx} = x^2 - y,\ y(0) = 2$ using Runge Kutta method of fourth order to find $y(0.1)$. [7M]

4. a) Find the harmonic conjugate of $e^{x^2-y^2}\cos 2xy$. Hence find $f(z)$ in terms of z. [7M]

   b) If $\sin(A+iB) = x+iy$, then prove that [7M]

   i. $\frac{x^2}{\cosh^2 B} + \frac{y^2}{\sinh^2 B} = 1$

   ii. $\frac{x^2}{\sin^2 A} - \frac{y^2}{\cos^2 A} = 1$.

5. a) Evaluate $\int_C \frac{z^3+z^2+2z+1}{(z-1)^3}dz$ where C is $|z| = 3$ using Cauchy's Integral formula. [7M]

   b) Evaluate $\int_C \frac{4-3z}{z(z-1)(z-2)}dz$ where C is $|z| = \frac{3}{2}$ using Cauchy's Residue theorem. [7M]

6. Using Laplace transform, solve $\frac{d^2y}{dt^2} - 4\frac{dy}{dt} - 12y = e^{3t}$, given that $y(0) = 1, y'(0) = -2$. [14M]

7. Find the interpolating polynomial for the following [14M]

x	0	1	2	5
y	2	3	12	147

Evaluate $y(3)$.

8. Given $\frac{dy}{dx} = \frac{y-x}{y+x}$, $y(0) = 1$ compute $y(0.02)$, $y(0.04)$ using Modified Euler's method. [14M]

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