

## FACULTY OF ENGINEERING

B.E. (EEE, EIE, M/Prod., A.E) IV Semester (CBCS) (Backlog) Examination.  
September / October - 2022

Time: 3 Hours

Subject: Engineering Mathematics-IV

Max. Marks: 70

(Missing data, if any, may be suitably assumed)

## PART - A

Note: Answer all the questions.

(10 x 2 = 20 Marks)

- Find  $L\{t e^{-t}\}$ .
- State second shifting theorem of Laplace transforms.
- Find the Fourier transform of  $f(x) = \begin{cases} 1, & -1 \leq x \leq 1 \\ 0, & |x| > 1 \end{cases}$ .
- Find the finite Fourier cosine transform of  $f(x) = x$  in  $[0, \pi]$ .
- Obtain  $Z\{2^n\}$ .
- If  $Z\{f_n\} = \frac{z^3 - 3z^2 + 2z + 1}{(z+3)^2(z-1)}$ , then find  $\lim_{n \rightarrow \infty} f_n$ .
- Perform two iterations of bisection method to obtain the smallest positive root of  $x^3 - 5x + 1 = 0$ .
- Using Euler's method, find an approximate value of  $y(0.2)$  for  $y' = x + y$ ,  $y(0) = 1$  with  $h = 0.1$ .
- Define correlation and regression.
- Find the rank correlation coefficient from the following data.

x	1	2	3	4	5
y	5	4	3	2	1

## PART - B

Note: Answer any five questions.

(5 x 10 = 50 Marks)

- (a) Find  $L\left\{\frac{1-e^t}{t}\right\}$ .  
(b) Using convolution theorem, find  $L^{-1}\left\{\frac{1}{s(s-1)}\right\}$ .
- Find the Fourier sine transform of  $f(x) = e^{-x}$  and hence evaluate  $\int_0^{\infty} \frac{x \sin mx}{1+x^2} dx$ .
- (a) Find  $Z\left\{\frac{\cos n\theta}{2^n}\right\}$ .  
(b) Use Z transforms to solve the difference equation  $y_{n+2} + y_{n+1} - 2y_n = 0$ ,  
 $y_0 = 4, y_1 = 0$ .

-2-

14. (a) Solve the following system of equations using Gauss elimination method.

$$x - y + z = 1, \quad -3x + 2y - 3z = -6, \quad 2x - 5y + 4z = 5$$

- (b) Using Lagrange's interpolation formula, find  $f(x)$  from the following data.

$x$ :	0	1	3	4
$f(x)$ :	-12	0	12	24

15. (a) Find the values of  $a, b, c$  so that  $y = a + bx + cx^2$  is the best fit to the data given below.

$x$ :	0	1	2	3	4
$y$ :	1	0	3	10	21

- (b) Two lines of regression are  $x + 2y = 5$ ,  $2x + 3y = 8$ . Find (i) mean values of  $x$  and  $y$   
(ii) the coefficient of correlation.

16. From the following table of values of  $x$  and  $y$ , obtain  $\frac{dy}{dx}$  and  $\frac{d^2y}{dx^2}$  for  $x = 1.0$ .

$x$ :	1.0	1.2	1.4	1.6	1.8	2.0	2.2
$y$ :	2.7183	3.3201	4.0552	4.9530	6.0496	7.3981	9.0250

17. Establish the formula  $\sigma_{x-y}^2 = \sigma_x^2 + \sigma_y^2 - 2r\sigma_x\sigma_y$ , where  $r$  is the correlation coefficient between  $x$  and  $y$ . Hence find  $r$  from the following data.

$x$ :	4	6	8	10	12
$y$ :	2	3	4	6	10