2022

1st Semester Examination

ELECTRONICS

Paper : ELC 101

Full Marks : 40 Time : Two Hours

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

Unit - 1

(Mathematical Methods)

Answer any ***two*** questions each from Group-A and Group-B; and ***one*** question from Group-C.

Group - A

Answer any ***two*** questions : 2×2=4

1. Define diagonal matrix. 2

2. Find the Laplace transform of $\cos^2 2t$. 2

3. What is the norm of a vector? What is the Hilbert space? 1+1

4. Check whether $f(z) = z^2$ and $f(z) = z^*$ are analytic functions of z from the concept of Cauchy-Riemann condition. 1+1

P.T.O.

Group - B

Answer any *two* questions : 4×2=8

5. State and prove Liouville's theorem. 1+3

6. Using Cauchy's integral formula, evaluate $\oint_c \frac{e^{2z}dz}{(z-1)(z-2)}$ where $|z| = 3$ and c is the circle. 4

7. Starting from $I = \left\langle f - \sum_i a_i\phi_i \mid f - \sum_j a_j\phi_j \right\rangle \geq 0$ derive Bessel's inequality $\langle f | f \rangle \geq \sum_n |a_n|^2$. 4

8. Illustrate the cayley-Hamilton theorem for the matrix A where : 4

$$A = \begin{pmatrix} 1 & 0 & 2 \\ 2 & -1 & 1 \\ 1 & 2 & 1 \end{pmatrix}$$

Group - C

Answer any *one* question : 8×1=8

9. What do you mean by convolution of two functions? State and prove the convolution theorem for Fourier transform. 2+(2+4)

10. Describe the Gram-Schmidt's orthogonalization process. Show that the Fourier transform of a Gaussian is Gaussian. 5+3

Unit - 2

(Computational Techniques)

Answer any ***two*** questions each from Group-A and Group-B; and ***one*** question from Group-C.

Group - A

Answer any ***two*** questions : $2\times2=4$

1. What are absolute and relative errors? 1+1

2. Round off the following numbers to three decimal places :

   4.5662, 63.88756, 0.60045, 7.31428 $\frac{1}{2}\times4$

3. What do you mean by interpolation and extrapolation? 1+1

4. What is the need of numerical techniques? 2

Group - B

Answer any ***two*** questions : $4\times2=8$

5. Write down the geometrical interpretation of trapezoidal rule for numerical integration. 4

6. Use Regula-Falsi method to solve 4

$$x^3 + 2x^2 + 10x - 20 = 0$$

7. Describe the Runge-Kutta method to solve ordinary differential equation. 4

8. Write short note on floating point representation. 4

P.T.O.

Group - C

Answer any ***one*** question : $8 \times 1 = 8$

9. Describe the Gauss-Elimination method to solve system of equations. 8

10. Use Lagrange's interpolation formula to find the value of y when $x = 10$, if the following values of x and y are given : 8

x	5	6	9	11
y	12	13	14	16