WEST BENGAL STATE UNIVERSITY

B.Sc. Honours 1st Semester Examination, 2021-22

ELSACOR02T-ELECTRONICS (CC2)

Time Allotted: 2 Hours | Full Marks: 40

The figures in the margin indicate full marks.
Candidates should answer in their own words and adhere to the word limit as practicable.
All symbols are of usual significance.

GROUP-A

1. Answer any ***five*** questions: 2×5 = 10

(a) Define Skew Hermitian matrix.

(b) State polar and exponential form of complex variables.

(c) State the D′ Alemberts ratio test.

(d) Show that the transpose of an orthogonal matrix is also orthogonal.

(e) Find the solution of $\frac{d^2x}{dt^2} + w^2x = 0$

(f) What is a unitary matrix?

(g) Define infinite series.

(h) Solve the differential equation $y' = 2t(25 - y)$.

GROUP-B

Answer any *six* questions 5×6 = 30

2. Find A^{-1} when 5

$$A = \begin{bmatrix} 1 & 1 & 2 \\ 9 & 2 & 0 \\ 5 & 0 & 3 \end{bmatrix}$$

3. Determine the Eigenvalues and Eigenvectors of the following matrix. 5

$$A = \begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{bmatrix}$$

4. Find the general solution of the equation $(D^2 + 3D + 2)y = x^2e^{3x}$ 5

5. (a) Give one example each of the following sequences. 3+2

(i) Convergent

(ii) Divergent

(iii) Oscillating

(b) Determine if the following series is convergent or divergent.

$$\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n}$$

6. Derive Harmonic and Conjugate Harmonic function using Cauchy-Riemann differential equation. 5

7. From definition, show that $\beta(m,n)=\beta(n,m)$ and also show that $\Gamma\left(\frac{1}{2}\right)=\sqrt{\pi}$. $2\frac{1}{2}+2\frac{1}{2}$

8. Evaluate $\int \frac{dx}{x^3-x^2-x-1}$ using partial fraction expansion method. 5

9. Using Cauchy's root test, determine whether the following series converges or not. 5

$$\sum_{n=1}^{\infty} x^n, \quad 0<x<1$$

10. Solve: $\frac{dy}{dx}+\frac{y}{x}=x^2y^7$ 5

11.(a) State the conditions for a complex function $f(z)$ be continuous at a point z_0. 2+3

(b) Check whether the following function is continuous.

$$f(z)=\begin{cases}\dfrac{z^2+4}{z-2i} & z\neq 2i\\ 3+4i & z=2i\end{cases}$$

12.(a) State the Legendre equation. 1+4

(b) Find the Legendre's polynomials $p_0(x), p_1(x), p_2(x)$ and $p_3(x)$.

N.B. : *Students have to complete submission of their Answer Scripts through E-mail / Whatsapp to their own respective colleges on the same day / date of examination within* 1 *hour after end of exam. University / College authorities will not be held responsible for wrong submission (at in proper address). Students are strongly advised not to submit multiple copies of the same answer script.*

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