BINDURA UNIVERSITY OF SCIENCE EDUCATION

FACULTY OF SCIENCE AND ENGINEERING

DEPARTMENT: ENGINEERING AND PHYSICS

PROGRAMME: BSc Honours Degree in Electronics Engineering

EEE4201: : HIGH SPEED NETWORKS

APR 2025

DURATION: 3 hours TOTAL MARKS: 100

INSTRUCTIONS TO CANDIDATES

The paper contents SEVEN questions, answer any FIVE questions. Each carries 20 marks

Only calculator is permitted

QUESTION 1:

a)Describe the concept of signal integrity in high-speed circuits and its main challenges. (8)

b)If the rise time of a signal is 2 ns, calculate the bandwidth required for accurate signal transmission. (12)

QUESTION 2:

a)Explain the importance of proper grounding in high-speed circuits. (8)

b)Given that a high-speed circuit has a current of 3 A and operates at a voltage of 5 V, calculate the power dissipation in the circuit. (12)

QUESTION 3:

(a)Explain the concept of characteristic impedance in a transmission line and its significance in high-speed circuits. (8)

(b)Given a transmission line with a length of 50 cm and a propagation velocity of 2×10^8 m/s, calculate the characteristic impedance of the transmission line if the wave travels through a dielectric material with a relative permittivity of 4 (12)

QUESTION 4:

a)What are the sources of noise in high-speed circuits, and how can they be mitigated? (8)

b)Given a signal with an amplitude of 1 V and a noise level of 0.1 V, calculate the signal- to-noise ratio (SNR). (12)

QUESTION 5:

a)Explain the concept of differential signaling and its advantages in high-speed networks. (8)

b)Given that the voltage difference between two differential signals is 1 V and the resistance of the load is 50 Ω, calculate the current in the circuit. (12)

QUESTION 6:

a) What are the key parameters involved in the design of high-speed PCB traces for signal transmission? (8)

b) Calculate the characteristic impedance of a PCB trace with a width of 0.5 mm, a height of 1 mm, and a relative permittivity of 4. Assume a stripline configuration. (12)

QUESTION 7:

a) What is clock skew, and why is it critical in high-speed circuits? (8)

b) If the clock signal has a period of 10 ns and the maximum allowed skew is 0.5 ns, calculate the maximum operating frequency of the system. (12)