BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

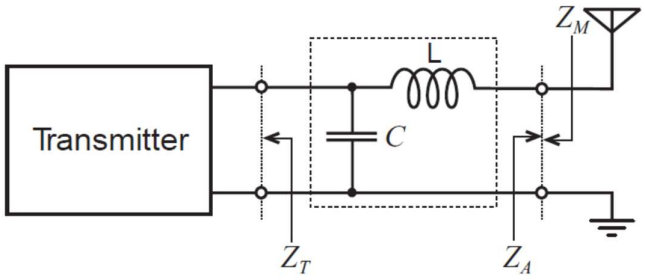
CLASS: MTECH **SEMESTER : II**
BRANCH: ECE (WIRELESS COMMUNICATION) **SESSION : SP/2025**

SUBJECT: EC543 RF CIRCUIT DESIGN

TIME: 3 Hours **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

			CO	BL
Q.1(a)	What is skin depth? What are the parameters which influence skin depth?	[5]	CO1, CO3	BL2
Q.1(b)	Compute the intrinsic wave impedance, phase velocity, and wavelengths of an electromagnetic wave on a printed circuit board material whose dielectric constant is 4.6 for the frequencies f=3 GHz.	[5]	CO1, CO3	BL3
Q.2(a)	Draw a circuit diagram of a high pass filter and find the overall ABCD parameter and transfer function response of the circuit.	[5]	CO1, CO2, CO3	BL2
Q.2(b)	An N = 3 Chebyshev bandpass filter is to be designed with a 3 dB passband ripple for a communication link. The centre frequency is at 2.4 GHz, and the filter must meet a bandwidth requirement of 20%. The filter has to be inserted into a 50 Ω characteristic line impedance. Find the inductive and capacitive elements of the filter.	[5]	CO1, CO3, CO4	BL6
Q.3(a)	Design a quarter wave transformer to match the 100Ω load resistance to 50 input impedance. Discuss the limitations of a quarter-wave transformer.	[5]	CO1, CO2, CO3	BL6
Q.3(b)	The output impedance of a transmitter operating at a frequency of 2 GHz is Z_T = (150 + j75) Ω. Design an L-section matching network, as shown in Figure, to deliver maximum power to the antenna whose input impedance is Z_A = (75 + jl5) Ω	[5]	CO1, CO2, CO3	BL6



Q.4(a)	What are the conditions of unconditional stability? Differentiate between transducer power gain and unilateral transducer power gain.	[5]	CO2, CO3	BL3
Q.4(b)	Find NF_{13} for the three cascaded networks, if $\mathrm{NF}_1 = 2\mathrm{dB}, \mathrm{G}_{a1} = 10\mathrm{dB}$, $\mathrm{NF}_{12} = 6\mathrm{dB}, \mathrm{G}_{a2} = 14\mathrm{dB}, \mathrm{NF}_3 = 10\mathrm{dB}, \mathrm{G}_{a3} = 18\mathrm{dB}$.	[5]	CO1, CO2, CO3	BL3
Q.5(a)	Mention the design steps for a two-port oscillator.	[5]	CO1, CO4, CO5	BL3
Q.5(b)	With the help of a circuit diagram, explain the double-balanced frequency mixer circuits.	[5]	CO1, CO2 CO4, CO5	BL2

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