K. K. Wagh Institute of Engineering Education & Research, Nashik

(An Autonomous Institute From A.Y. 2022-23)

WINTER-2025	
Exam Seat No.:	
Academic Year:2025-2026	Semester:V
Class:TY	Program:B.Tech
Branch Code:ETC	Pattern:2022
Name of Course:Electromagnetics Engineering	Course Code:ETC223001
Max. Marks:60	Duration:2.30 Hrs.

Instructions: Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.

1. This question paper contains __02___page(s).
2. Answer to each new question is to be started on a new page.
3. Assume suitable data wherever required, but justify it.
4. Draw the neat labelled diagrams, wherever necessary.
5. The last columns indicates the Course Outcome and level of Blooms Taxonomy of the Question/sub-question.

		Marks	CO
Question No. 1			
1a)	Explain how Coulomb's Law forms the foundation for defining the electric field intensity.	(6)	CO 1
Question No. 2			
2a)	State and derive Ampere's Circuital Law .	(6)	CO 2
Question No. 3			
3a)	State and explain Faraday's laws and Lenz's law. Derive the expression for induced emf in a coil moving in a time-varying magnetic field, and explain how the negative sign in Faraday's law relates to energy conservation.	(8)	CO 3
	OR		
3b)	In free space $E = 20cos\left(wt - 50x\right)a_y V/m$. Calculate $J_d, H \quad and \quad w$.	(8)	CO 3
3c)	Write Maxwell's equation in phasor form.	(8)	CO 3
	OR		
3d)	In the material for which $\sigma = 6S/m,\ \in_r = 2.5$. The electric field intensity $E = 250 \quad \sin \quad \left(10^{10}t\right) \quad V/m$. Find the conduction and displacement current densities and the frequency at which both have equal magnitudes.	(8)	CO 3
Question No. 4			
4a)	The primary constants of a line working at 1 MHz are R = 83.4Ω/km, L= 2.29mH/km, C=4.85×10^-2 µF/km, G = 0 Calculate the values of Z0, β, λ and v.	(8)	CO 4
	OR		
4b)	Define VSWR and reflection coefficient and derive the expression for it in terms of reflection coefficient.	(8)	CO 4

4c) State and derive the Poynting theorem from Maxwell's equations. (8) CO 4

Explain each term and its physical significance.

OR

4d) What is Skin depth? Determine the skin depth of aluminum at a frequency of 2 MHz, conductivity $\sigma = 3.82 \times 10^7$ S/m,and relative permeability μr= 1. (8) CO 4

Question No. 5

5a) Explain the different microwave frequency bands as per the IEEE standard and their typical applications. (8) CO 5

OR

5b) Define the following antenna terminologies: (8) CO 5

1. Radiation Pattern
2. Beamwidth
3. Directivity
4. Antenna Efficiency

5c) Define a waveguide and explain its importance in microwave transmission. Describe the various types of waveguides. (8) CO 5

OR

5d) What is an antenna? Explain the different types of antennas commonly used in communication systems. (8) CO 5

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