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:2023
Name of Course:Electromagnetic Engineering	Course Code:2302301
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)	State and explain Gauss's Law. What are different types of charge distributions?	(6)	CO1
Question No. 2			
2a)	Derive the expression to find magnetic field intensity (H) due to infinitely long straight filament.	(6)	CO2
Question No. 3			
3a)	Explain the role of Lenz's law in Faraday's law of induction.	(8)	CO3
	OR		
3b)	Determine the value of *"k"* such that the following pair of fields satisfies Maxwell's equations in the region where. $\rho_v = 0, \sigma = 0, \mu_r = 1 and \quad \epsilon_r = 1$. $D = 5xa_x - 2ya_y + kza_z \big) \mu C / m^2 and \quad B = 2a_y \quad mT$	(8)	CO3
3c)	Define Displacement current density and hence show that curl of $H = \quad J_c + J_d$.	(8)	CO3
	OR		
3d)	Write Maxwell's equations for static field in integral and point form.	(8)	CO3
Question No. 4			
4a)	A generator of 1V, 1kHz supplies a power to 50km open wire line terminated into characteristic impedance has following parameters: R=11 Ω/km, L=0.00367 H/km, G=0.8 mho/km, C=8.35 nF/km Calculate $\alpha, \quad \beta, \quad velocity \quad v \quad and \quad wavelength \quad \lambda.$	(8)	CO4
	OR		
4b)	State and derive the Poynting theorem from Maxwell's equations.	(8)	CO4

4c)	Derive the relationship between primary and secondary constants of a transmission line.	(8)	CO4

OR

4d)	Derive the general wave equation in terms of the E field.	(8)	CO4

Question No. 5

5a)	Discuss in detail the advantages of using microwaves over lower-frequency signals. Explain at least four major applications of microwaves.	(8)	CO 5

OR

5b)	Derive the expressions for the cutoff frequency, cutoff wavelength, guide wavelength in a rectangular waveguide.	(8)	CO 5
5c)	A free-space microwave link consists of a transmitter and a receiver, each having an antenna gain of 30 dB. The link operates at a frequency of 10 GHz, and the distance between the transmitter and receiver is 20 km. If the transmitter radiates 15 W of power, calculate: 1. The power received by the receiver, and 2. The path loss of the link in dB.	(8)	CO 5

OR

5d)	Define the following antenna terminologies: 1. Radiation Pattern 2. Radiation Power Density 3. Radiation Intensity 4. Directivity and Gain.	(8)	CO 5

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