

Hall Ticket Number:

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Code No. : 14467 N/O

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS), HYDERABAD

Accredited by NAAC with A++ Grade

B.E. (E.C.E.) IV-Semester Main &amp; Backlog Examinations, July-2023

Electromagnetic Field Theory

Time: 3 hours

Note: Answer all questions from Part-A and any FIVE from Part-B

Max. Marks: 60

Part-A (10 × 2 = 20 Marks)

Q. No.	Stem of the question	M	L	CO	PO/PSO
1	State the Coulomb's law of force between two point charges separated by the distance R	2	1	1	1
2	Express curl of a vector A in Cylindrical coordinate system	2	2	1	1
3	Draw the electric flux pattern due to (i) single point charge and (ii) dipole	2	1	2	1
4	Define the terms linear, homogeneous and isotropic with respect to dielectric medium	2	2	2	1
5	Find the magnetic field intensity due to infinite length current carrying conductor at a distance 0.5 m with current $I = 2A$ along z axis.	2	1	3	2
6	Find the magnetic field Intensity $\vec{H}$ if Plane $y=0$ carries sheet current with density of $\vec{K}=2.5a_z$ mA/m.	2	2	3	2
7	Calculate skin depth of a material for which $\sigma=5$ S/m and $\mu_r=2$ at a frequency 1.25 GHz	2	1	4	2/2
8	In free space $\vec{E}=16e^{-x/20} \sin(2 \times 10^8 t - 2x)a_z$ V/m. Find the direction of propagation, wavelength, velocity of propagation and intrinsic impedance	2	2	4	4/2
9	Draw the equivalent circuit of transmission line with proper labeling of parameters	2	2	5	1/2
10	A parallel polarized wave is incident from air onto distilled water with $\epsilon_r = 81$ . Find the Brewster's angle $\theta_B$ ?	2	2	5	2/2
<b>Part-B (5 × 8 = 40 Marks)</b>					
11. a)	Derive the expression for $\vec{E}$ due to the infinite line of charge placed along z axis.	4	2	1	1
b)	Find the electric field intensity $\vec{E}$ due to infinite length coaxial cable at any point	4	3	1	2
	(i) Inside the inner cylinder				
	(ii) Between the inner and outer cylinders				
	(iii) Out side the outer cylinder				

Contd... 2

12. a)	A scalar potential in the certain region is given by $V = 5x + 4y^2 + 2z^3$ volts. Find Electric field intensity $\vec{E}$ at (2,3,5).	4	3	2	2
b)	Find the work done to move a point charge of 5 mC from point P(2,1,3) to point A(4,-2,5) in the electric field $\vec{E} = 4\hat{a}_x + 3x^2\hat{a}_y + 2yz^2\hat{a}_z$	4	3	2	2
13. a)	Derive the magnetic field intensity due to a infinite current sheet.	4	2	3	4
b)	Evaluate the inductance of a solenoid with length "l" and number of turns "N"	4	3	3	2
14. a)	Formulate Maxwell's differential equations from the corresponding integral equations using Gauss Divergence theorem and Stokes theorem	4	2	4	4/2
b)	What is the inconsistency of Ampere's circuital law and how it is rectified and derive the modified Ampere's Circuital law	4	3	4	2/2
15. a)	State Poynting vector theorem and Prove the Poynting vector theorem for electromagnetic wave	4	2	5	4/2
b)	Formulate the expression for reflection coefficient of electric field when the wave incident with normal incidence $\theta_i=0^\circ$ .	4	4	5	4/2
16. a)	Define Conservative property and show that electrostatic field is conservative	4	4	1	2
b)	What are the applications of boundary conditions? Derive the boundary conditions for static electric fields between dielectric and dielectric media interface	4	4	2	1,2
17.	Answer any <b>two</b> of the following:				
a)	What are the different ways of finding the magnetic field intensity and express magnetic field intensity $\vec{H}$ and magnetic vector potential $\vec{A}$ in terms of current elements $I\vec{dl}$ ,	4	1	3	2
b)	What are the advantages of wave equations? Derive wave equation for electric field starting from Faraday's law of electromagnetic induction in differential form	4	1	4	2/2
c)	When the input impedance of a transmission line is given by $Z_{in}(l) = Z_0 \left[ \frac{Z_L + jZ_0 \tan \beta l}{Z_0 + jZ_L \tan \beta l} \right]$ Calculate input impedance of with (i) short load , (ii) Matched load, (iii) open load	4	3	5	4/2

M : Marks; L: Bloom's Taxonomy Level; CO; Course Outcome; PO: Programme Outcome

i)	Blooms Taxonomy Level - 1	20%
ii)	Blooms Taxonomy Level - 2	35%
iii)	Blooms Taxonomy Level - 3 & 4	45%

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