Hall Ticket Number:

Code No. : 14467 AS N/O

VASAVI COLLEGE OF ENGINEERING *(AUTONOMOUS)*, HYDERABAD

Accredited by NAAC with A++ Grade

B.E. (E.C.E.) IV-Semester Advanced Suppl. Examinations, Aug./Sept.-2023

Electromagnetic Field Theory

Time: **3 hours** Max. Marks: **60**

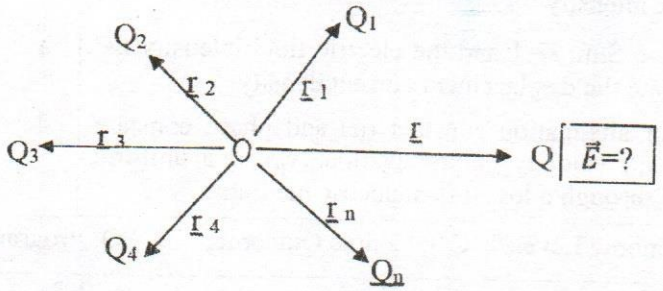
*Note: Answer all questions from **Part-A** and any **FIVE** from **Part-B***

Part-A (10× 2 = 20 Marks)

Q. No.	Stem of the question	M	L	CO	PO/PSO
1.	State Coulomb's law in vector form	2	1	1	1
2.	Convert a point P(1,3,5) from Cartesian coordinates to Cylindrical coordinates	2	2	1	1
3.	What is the continuity equation for electrostatic fields	2	2	1	1
4.	Determine the volume charge density due to the electric flux density $D=9xy\,\widehat{a_x} + 5x^2\,\widehat{a_y}$	2	3	1	2
5.	Give the magnetic boundary conditions between two media	2	1	3	1
6.	Find the magnetic field Intensity H at (0,0,0), if Plane y=1 carries a current sheet density of $K=50a_z$ mA/m.	2	3	3	2
7.	What is the Faraday's law of electromagnetic induction	2	1	4	1/2
8.	Write the wave equations for free space	2	1	5	1/2
9.	Define Skin depth	2	1	5	1/2
10.	Draw the equivalent circuit of a transmission line and define the primary constants.	2	1	5	1/2

Part-B (5×8 = 40 Marks)

11. a)	Find the electric field intensity on a point charge Q located at a distance 'r' units from the origin due to N no of point charges located at different distances 'r_1', 'r_2'.... 'r_n' units respectively as shown in figure.	5	2	1	1



b)	Find the total charge (a) on line $0<x<5$m if $\rho_l=12x^2$ mC/m (b) On Cylinder $\rho=3$, $0<z<4$, if $\rho_s=\rho z^2$ nC/m^2 and (c) with in sphere given r=4m, $\rho_v=\frac{10}{r\sin\theta}$ C/m^3	3	3	1	2
12. a)	Explain the Gauss's law along with its applications and under what conditions the law can be applied.	5	2	1	
b)	Find the electric field of a potential function V(x,y) given by log (x+y) at the point (1,1,0)				

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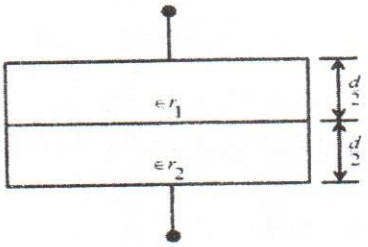
13. a)	Obtain an expression for differential magnetic field strength $d\vec{H}$ due to differential current element Idl at the origin in the positive Z- direction using Biot-Savart's Law	5	2	3	3
b)	An infinitely long conducting filament is placed along the X-axis and carries current 6mA in the i_x direction. Find the magnetic field Intensity H at (-1,3,4).	3	3	3	2
14. a)	Derive the Maxwell's equations in differential form for time varying fields and also give them in word statements	5	2	4	3/2
b)	What is the inconsistency of Amperes law? How it is rectified and derive the modified expression for Ampere's law?	3	4	4	3/2
15. a)	Define the Brewster's angle and obtain the Brewster angle for a parallelly polarized wave with oblique incidence in a perfect dielectric medium.	5	4	5	3/2
b)	In a medium $E=16e^{-x/20}$ sin $(2X10^8t-2x)a_z$ V/m. Find the direction of propagation, the propagation constant and velocity of propagation	3	3	5	2/2
16. a)	Find the electric field Intensity at a point P due to an infinite straight line with constant line charge density ρ_L C/m.	4	1	1	1
b)	Determine the capacitance of the capacitor shown. Take $\epsilon_{r1} = 4, \epsilon_{r2} = 6$, d= 5mm and s = 30cm^2. 	4	3	1	2
17.	Answer any *two* of the following:				
a)	Explain the significance of magnetic vector potential and how it can be used to find magnetic field intensity	4	2	3	1
b)	In a material for which σ=5 S/m, ϵ_r=1 and the electric field intensity $\vec{E}$= 250 sin 10^{10} t V/m. Calculate the displacement current density	4	3	4	2/2
c)	Derive the expressions for attenuation constant (α) and phase constant (β), intrinsic impedance (η), velocity of propagation (v_p), if a uniform plane wave is propagating through a loss less dielectric medium.	4	2	5	3/2

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

i)	Blooms Taxonomy Level – 1	20%
ii)	Blooms Taxonomy Level – 2	40%
iii)	Blooms Taxonomy Level – 3 & 4	40%

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