Hall Ticket Number:

Code No. : 13314

VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD

B.E. (EEE: CBCS) III-Semester Main Examinations, December-2018

Electromagnetic Field Theory

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

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

Q.No.	Stem of the question	M	L	CO	PO
	Part-A (10 × 2 = 20 Marks)				
1.	Determine the gradient of the given field $V=\rho z\sin\varphi+z^2\cos^2\varphi+\rho^2$.	2	3	1	1,2,3
2.	Evaluate the electrostatic force of repulsion between two α-particles of charge 4×10^{-19} C each and separated by distance of 10^{-10} Cm.	2	3	1	1,2,3
3.	Define the terms i) dipole moment ii) Polarization.	2	1	2	2,3,10
4.	An electric field from a medium whose relative permittivity is 8 passes into a medium of relative permittivity 3. If **E** makes an angle of 45^0 with the boundary normal then what angle does the field makes with the interface in the second dielectric.	2	2	4	1,2,3,4, 10
5.	Given the magnetic flux density $\rho_s/2\ \mathbf{a}_\varphi$ Wb/m^2, calculate the total magnetic flux crossing the surface $\varphi=\pi/2$, $1\le\rho\le2$m, $0\le z\le5$m.	2	3	3	1,2,3,10
6.	State Ampere's Law.	2	1	3	1,2,3,10
7.	A 10GHz plane wave travelling in free space has an amplitude 15V/m. Find the wave length.	2	3	5	1,2,3,4, 8,9,10
8.	Define the term loss tangent and explain its significance.	2	1	5	1,2,3,4, 8,9,10
9.	List the methods of EMI controlling techniques.	2	1	6	2,3,4,5, 8,9,10
10.	Define the term shielding index.	2	1	6	2,3,4,5, 8,9,10
	Part-B (5 × 8 = 40 Marks)				
11. a)	Find **E** at P(1,1,1) caused by four identical 3nC charges located at P_1(1,1,0), P_2(1,-1,0), P_3(-1,1,0) and P_4(-1,-1,0).	5	3	1	1,2,3
b)	Derive the expression for electric filed intensity due to a volume charge density ρ_v. Use Gauss's law.	3	1	1	1,2,3
12. a)	An electric field strength of 1000 V/m in a medium of $\varepsilon_r=1$ is at an angle of 45^0 to the normal of the boundary. Find the magnitude of **E** in air.	4	3	4	1,2,3,4, 10
b)	Derive continuity equation.	4	1	5	1,2,3,4, 8,9,10
13. a)	Determine **H** at P(0.4, 0.3, 0) in the field of an 8A filamentary current is directed inward from infinity to the origin on the positive *x*-axis, and then outward to infinity along the *y*-axis.	5	3	3	1,2,3,10
b)	Derive magnetic Boundary Conditions.	3	1	4	1,2,3,4, 10

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14. a)	The electric field intensity of uniform plane wave in air is 7500 V/m in the $\mathbf{a}_y$ direction, The wave is propagating in the $\mathbf{a}_x$ direction at a frequency of 2×10^9 rad/sec Find : (a) the wave length (b) the frequency (c) the time period (d) the amplitude of **H**.	4	3	5	1,2,3,4, 8,9,10
b)	State and prove Poynting's theorem.	4	3	5	1,2,3,4, 8,9,10
15. a)	Differentiate between inter system EMI and intra system EMI with two examples.	3	2	6	2,3,4,5, 8,9,10
b)	Discuss EMI control Techniques in detail.	5	2	6	2,3,4,5, 8,9,10
16. a)	A Sheet of charge density $\rho_s=2$ nC/m^2 is placed at the plane x=3 in free space and a line charge $\rho_L=20$ nC/m is located at x=1, z=4 find **E** at P(4,5,6).	5	3	1	1,2,3
b)	Write the general procedure for solving Laplace's and Poisson's equation.	3	1	2	2,3,10
17.	Answer any ***two*** of the following:				
a)	Differentiate between scalar and vector magnetic potentials.	4	2	3	1,2,3,10
b)	Derive the equation for wave propagation in a lossy dielectric.	4	1	4	1,2,3,4, 10
c)	List the disadvantages of electromagnetic interference.	4	2	6	2,3,4,5, 8,9,10

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

S. No.	Criteria for questions	Percentage
1	Fundamental knowledge (Level-1 & 2)	56.25
2	Knowledge on application and analysis (Level-3 & 4)	43.75
3	*Critical thinking and ability to design (Level-5 & 6) (*wherever applicable)	-