Hall Ticket Number:

| 1 | 6 | 0 | 2 | 2 | 0 | 7 | 3 | 5 | 1 | 1 | 7 |
|---|---|---|---|---|---|---|---|---|---|---|---|

**Code No. : 14447**

# VASAVI COLLEGE OF ENGINEERING *(AUTONOMOUS)*, HYDERABAD

*Accredited by NAAC with A++ Grade*

## B.E. (E.C.E.) IV-Semester Main & Backlog Examinations, July-2022

## 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 |
|---|---|---|---|---|---|
| 1. | Calculate the cross product of $5a_x$ and $9a_y$. | 2 | 2 | 1 | 2 |
| 2. | Write the applications of Gauss Law. | 2 | 1 | 1 | 1 |
| 3. | What is the Capacitance for a parallel plate capacitor? | 2 | 1 | 2 | 1 |
| 4. | What is Poisson's equation? | 2 | 1 | 2 | 1 |
| 5. | Define Magnetomotive Force. | 2 | 1 | 3 | 1 |
| 6. | What is the Gauss Law for Magnetic Fields? | 2 | 1 | 3 | 1 |
| 7. | State the Ampere's modified law. | 2 | 1 | 4 | 1 |
| 8. | A loop of area 200cm$^2$ is positioned perpendicular to a uniform magnetic field. Without changing in direction of the magnetic field, its magnitude is reduced by 0.08T in the time interval 0.02s. Compute change in flux. | 2 | 3 | 4 | 2 |
| 9. | Discuss the importance of Skin effect. | 2 | 1 | 5 | 1 |
| 10. | What is the range of Standing Wave Ratio? | 2 | 1 | 5 | 1 |
| | ***Part-B (5 × 8 = 40 Marks)*** | | | | |
| 11. a) | Explain Coulombs Law. | 4 | 2 | 1 | 1 |
| b) | A point charge, $Q$ = 30 nC, is located at the origin in Cartesian coordinates. Find the electric flux density **D** at (1, 3, -4) m. | 4 | 3 | 1 | 2 |
| 12. a) | Prove that $E = -\nabla V$ in an Electric Field. | 4 | 2 | 2 | 2 |
| b) | An electrostatic field is given by $E = \left(\frac{x}{2} + 2y\right)a_x + 2xa_y$ V/m. Find the work done in moving a point charge $Q$=-20μC (*a*) from the origin to (4, 0, 0) m, and (*b*) from (4, 0, 0) m to (4, 2, 0) m. | 4 | 3 | 2 | 2 |

*Contd... 2*

**Code No. : 14447**

| | | | | | |
|---|---|---|---|---|---|
| 13. a) | Explain Biot-savart's Law. | 4 | 2 | 3 | 1 |
| b) | The flux density at a point in the space is given by B= 8x $a_x$+4ky $a_y$+8 $a_z$ Wb/$m^2$ . Compute the value of constant k. | 4 | 3 | 3 | 2 |
| 14. a) | Write four Maxwell equations in Point form and Integral form for time varying fields. | 4 | 2 | 4 | 1, PSO3 |
| b) | In free space, $E(z,t)=10^3 \sin(\omega t-\beta z)a_y$ (V/m). Obtain $H(z,t)$. | 4 | 3 | 4 | 2, PSO3 |
| 15. a) | Derive equations for wave propagation in good conductors. | 4 | 3 | 5 | 2, PSO3 |
| b) | Discuss about reflection of uniform plane wave at normal incidence. | 4 | 2 | 5 | 1, PSO3 |
| 16. a) | Derive the expression for E for an infinite line charge. | 4 | 3 | 1 | 2, PSO3 |
| b) | Derive the boundary conditions in static electric fields. | 4 | 3 | 2 | 2 |
| 17. | Answer any ***two*** of the following: | | | | |
| a) | An infinitely long, straight, filamentary current *I* along the *z* axis in cylindrical coordinates is available. A point in the $z$ =0 plane is selected with no loss in generality. Compute H. | 4 | 3 | 3 | 2, PSO3 |
| b) | Explain Faraday's law | 4 | 2 | 4 | 1 |
| c) | In free space, E($z$, $t$) = 50 cos ($\omega t$- $\beta z$ )$a_x$ (V/m). Find the average power crossing a circular area of radius 2.5 m in the plane $z$ =const. | 4 | 3 | 5 | 2, PSO3 |

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

| | | |
|---|---|---|
| i) | Blooms Taxonomy Level – 1 | 20% |
| ii) | Blooms Taxonomy Level – 2 | 32.50% |
| iii) | Blooms Taxonomy Level – 3 & 4 | 47.50% |

*****