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**KAMALA INSTITUTE OF TECHNOLOGY & SCIENCE, SINGAPUR**  
**23EE28PC305**

**II.B. Tech. I. Semester Regular Examinations, Dec. 2024/Jan. 2025**

**ELECTROMAGNETIC FIELDS**

**(EEE)**

**Time: 3 Hours**

**Max.Marks:60**

Note: Question paper consists of Part-A & Part-B.

i) **Part-A** for 10M, ii) **Part-B** for 50marks

- Part A** is compulsory, consists of 10 sub questions from all units carrying equal marks.
- Part-B** consists of **10 questions** (numbered from 2 to 11) carrying **10marks** each. From each unit there are 2 questions and the students should answer one of them. Hence the student should answer **5 questions** from **Part-B**.

| <b>PART-A</b> |                                                                                                                                |              | <b>(10Marks)</b> |
|---------------|--------------------------------------------------------------------------------------------------------------------------------|--------------|------------------|
| <b>Q.No</b>   | <b>Questions</b>                                                                                                               | <b>Marks</b> | <b>BTL</b>       |
| <b>1.a)</b>   | State and explain Coulomb's law                                                                                                | <b>1</b>     | <b>1</b>         |
| <b>1.b)</b>   | Using Gauss's law, find E at any point due to long infinite wire                                                               | <b>1</b>     | <b>1</b>         |
| <b>1.c)</b>   | State faradays laws of electro magnetic induction.                                                                             | <b>1</b>     | <b>1</b>         |
| <b>1.d)</b>   | Define dielectric strength?                                                                                                    | <b>1</b>     | <b>1</b>         |
| <b>1.e)</b>   | What is the relation between magnetic flux density and magnetic circuit?                                                       | <b>1</b>     | <b>1</b>         |
| <b>1.f)</b>   | Write down the magnetic boundary conditions?                                                                                   | <b>1</b>     | <b>1</b>         |
| <b>1.g)</b>   | Derive the expression for self-inductance of solenoid and torrid.                                                              | <b>1</b>     | <b>1</b>         |
| <b>1.h)</b>   | Define Elliptical and Linear Polarization?                                                                                     | <b>1</b>     | <b>1</b>         |
| <b>1.i)</b>   | List the properties of conductor and dielectric material.                                                                      | <b>1</b>     | <b>1</b>         |
| <b>1.j)</b>   | What is significance of displacement current density?                                                                          | <b>1</b>     | <b>1</b>         |
| <b>PART-B</b> |                                                                                                                                |              | <b>(50Marks)</b> |
| <b>Q.No.</b>  | <b>Questions</b>                                                                                                               | <b>Marks</b> | <b>BTL</b>       |
| <b>2. a)</b>  | Derive an expression for the electric field intensity at any point due to a uniformly line charge with density $c/m$           | <b>5M</b>    | <b>5</b>         |
| <b>b)</b>     | State gauss law for the in electric fields. Derive its integral and differential forms. Make at least two applications?        | <b>5M</b>    | <b>5</b>         |
| <b>OR</b>     |                                                                                                                                |              |                  |
| <b>3. a)</b>  | State and explain Curl, Gradient and Divergence. Also find the potential due to an electric dipole                             | <b>5M</b>    | <b>1</b>         |
| <b>b)</b>     | Define the potential difference in electric field. Give the relation between potential difference in terms of field intensity. | <b>5M</b>    | <b>5</b>         |
| <b>4. a)</b>  | The capacitance of a parallel plate condenser is $0.2\mu F$ . Potential difference between the plates is 2V. Calculate the     | <b>5M</b>    | <b>1</b>         |

|              |                                                                                                                                                                                                                                      |           |          |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|----------|
|              | energy stored by the charged condenser.                                                                                                                                                                                              |           |          |
| <b>b)</b>    | Derive Poisson's and Laplace equations starting from point form of Gauss Law                                                                                                                                                         | <b>5M</b> | <b>5</b> |
| <b>OR</b>    |                                                                                                                                                                                                                                      |           |          |
| <b>5. a)</b> | A parallel plate capacitor has conducting plates of area equal to $0.04\text{m}^2$ . The plates are separated by a dielectric material whose $\epsilon_r = 2$ with the plate separation of $1\text{cm}$ . Find its capacitance value | <b>5M</b> | <b>1</b> |
| <b>b)</b>    | Derive Equation of continuity. What is its significance?                                                                                                                                                                             | <b>5M</b> | <b>5</b> |
| <b>6. a)</b> | Using Biot Savarts Law, find H at any point on the axis of a circular current carrying coil.                                                                                                                                         | <b>5M</b> | <b>1</b> |
| <b>b)</b>    | Explain the concepts of scalar and vector magnetic potential?                                                                                                                                                                        | <b>5M</b> | <b>1</b> |
| <b>OR</b>    |                                                                                                                                                                                                                                      |           |          |
| <b>7. a)</b> | Derive an expression for force between two current carrying conductors                                                                                                                                                               | <b>5M</b> | <b>5</b> |
| <b>b)</b>    | Derive the expression for coefficient of coupling in terms of mutual and self-inductances                                                                                                                                            | <b>5M</b> | <b>5</b> |
| <b>8. a)</b> | Write Maxwell's equation for static fields. Explain how they are modified for time varying electric and magnetic fields.                                                                                                             | <b>5M</b> | <b>1</b> |
| <b>b)</b>    | Derive an expression for motional and transformer induced emf?                                                                                                                                                                       | <b>5M</b> | <b>5</b> |
| <b>OR</b>    |                                                                                                                                                                                                                                      |           |          |
| <b>9. a)</b> | Explain the concept of displacement current and obtain an expression for the Displacement current density                                                                                                                            | <b>5M</b> | <b>1</b> |
| <b>b)</b>    | State and explain Faraday's laws of electromagnetic induction with its integral and point forms                                                                                                                                      | <b>5M</b> | <b>1</b> |
| <b>10.a)</b> | State and prove poynting theorem                                                                                                                                                                                                     | <b>5M</b> | <b>1</b> |
| <b>b)</b>    | Determine the general solution of uniform plane wave equations                                                                                                                                                                       | <b>5M</b> | <b>5</b> |
| <b>OR</b>    |                                                                                                                                                                                                                                      |           |          |
| <b>11.a)</b> | Derive the general wave equations? And also discuss the wave motion in good conductors?                                                                                                                                              | <b>5M</b> | <b>5</b> |
| <b>b)</b>    | Describe wave propagation in good conductors and derive $\alpha$ , $\beta$ , $\gamma$ , $\delta$ and $\eta$ for the same.                                                                                                            | <b>5M</b> | <b>5</b> |

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