

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI  
(MID SEMESTER EXAMINATION)**

CLASS: B.TECH  
BRANCH: EEE

SEMESTER: III  
SESSION: MO/2022

SUBJECT: EE253 ENGINEERING ELECTROMAGNETICS

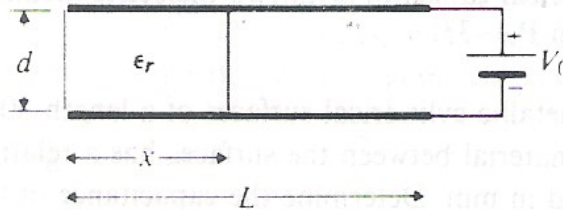
TIME: 2 HOURS

FULL MARKS: 25

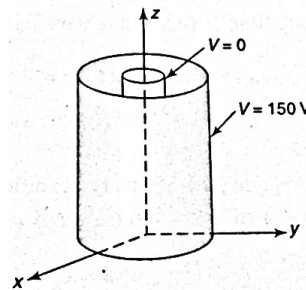
**INSTRUCTIONS:**

1. The total marks of the questions are 25.
2. Candidates attempt for all 25 marks.
3. Before attempting the question paper, be sure that you have got the correct question paper.
4. The missing data, if any, may be assumed suitably.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

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|  |     | CO  | BL       |
| Q1 (a) What do you understand by electrostatic forces and torques in terms of stored electrostatic energy? Write down their expressions.   | [2] | CO1 | BL1, BL2 |
| Q1 (b) How can you find the torque acting on the circuit under the condition of constant flux linkage?   | [3] | CO1 | BL2      |
| Q2 (a) Define the term vector magnetic potential. What is its SI unit?   | [2] | CO1 | BL1      |
| Q2 (b) Derive Poisson's and Laplace's equations.   | [3] | CO2 | BL2      |
| Q3 (a) A parallel-plate capacitor of width $w$ , length $L$ , and separation $d$ is partially filled with a dielectric medium of dielectric constant $\epsilon_r$ , as shown in Fig. A battery of $V_0$ volts is connected between the plates. Find distance $x$ such that the electrostatic energy stored in each region is the same. | [2] | CO2 | BL3      |



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| Q3 (b) Find the potential function and the electric field intensity for the region between two concentric right cylinders, where $V = 0$ at $r = 1\text{mm}$ and $V = 150\text{V}$ at $r = 20\text{mm}$ . Neglect fringing. | [3] | CO2 | BL3 |
|---|-----|-----|-----|



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| Q4 (a) Write down Maxwell's equations for time-varying fields in differential form and explain their physical significance.             | [2] | CO2 | BL1, BL2 |
| Q4 (b) Explain the uniqueness theorem.  | [3] | CO2 | BL2      |
| Q5 (a) What are the boundary conditions for electrostatic and magnetostatic fields in the regions having different physical properties? | [2] | CO2 | BL1      |
| Q5 (b) How would you prove that within a charge-free region, the potential can not attain a maximum value?                              | [3] | CO1 | BL4      |