BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: B.TECH
BRANCH: EEE

SEMESTER : MO/2022
SESSION : 2022-23

SUBJECT: EE253 ENGINEERING ELECTROMAGNETICS

TIME: 03 Hours

FULL MARKS: 50

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates

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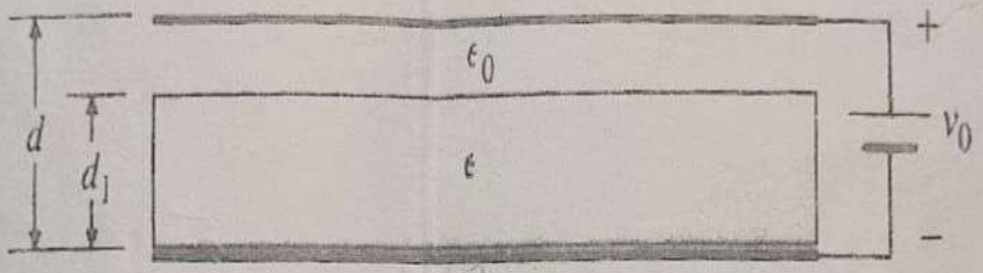
Q.1(a) Derive the expressions for electrostatic forces and torques in terms of stored electrostatic energy. [5]

Q.1(b) A constant voltage V_0 is applied to a partially filled parallel-plate capacitor as shown in figure below. The permittivity of the dielectric is ε, and the area of the plates is S. Find the force on the upper plate. [5]



Q.2(a) For source-free lossless and lossy simple medium, obtain the wave equations governing electric time-varying fields. [5]

Q.2(b) In spherical coordinates, V = -25 V on a conductor at r = 2 cm and V = 150 V at r = 35 cm. The space between the conductors is a dielectric for which $\varepsilon_r = 3.12$. Find the surface charge densities on the conductors. [5]

Q.3(a) Explain with the help of a diagram, the space-time behaviour of the total field in the medium if the incidence of an electro-magnetic wave on a plane dielectric boundary is normal. Write down the expressions of electric and magnetic fields for incident, reflected and transmitted wave. [5]

Q.3(b) If a wave with a frequency of 100 MHz propagates in free space, find the propagation constant. [5]

Q.4(a) What do you mean by polarization? Describe linear, circular, and elliptical polarization. [5]

Q.4(b) How would you define reflection and transmission coefficient in terms of intrinsic impedances in electrostatic and magnetostatic fields? [5]

Q.5(a) What is meant by skin depth of a conductor? How is it related to attenuation constant? Mention the SI unit of phase constant and attenuation constant. [5]

Q.5(b) What is Hertzian Dipole? Explain the radiation pattern of a Hertzian dipole. What do you mean by radiation resistance? [5]

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