Code No: 153AR

R18

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech II Year I Semester Examinations, March - 2021
ELECTROMAGNETIC FIELDS
(Electrical and Electronics Engineering)

Time: 3 hours

Max. Marks: 75

Answer any five questions
All questions carry equal marks
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1.a)   Derive an expression for electric field intensity due to an electric dipole.
  b)   State and describe the coulombs law with units.   [8+7]

2.   A spherical volume charge density distribution is given by $\rho = \rho_o (1 - r^2/a^2)$; ($r<=a$) and $\rho = 0 (r>a)$.
   a) Calculate the total charge Q
   b) Find the electric field intensity E outside the charge distribution.
   c) Find the electric field intensity inside.
   d) Show that the maximum value of E is at $r = 0.745$ a.   [15]

3.a)   What is the necessity of studying the dielectric boundary conditions?
  b)   Two parallel conducting plates 3 cm apart and situated in air are connected to a source of constant potential difference of 72 kV. (i) Find the electric field intensity between the plates. Comment on the result given that the dielectric strength of air is 30 kV/cm. (ii) If a mica sheet ($\varepsilon_r = 4$) of thickness 1 cm is introduced between the plates, what are the field intensities in air and mica. Comment on the result given that the dielectric strength of mica is 1000 kV/cm.   [8+7]

4.a)   Derive the ohms law in point form.
  b)   State and explain continuity equation of current in integral form and point form.
                                                                                          [8+7]

5.a)   Using Biot savarts law, find H inside a long solenoid carrying a current I and show that H at the ends of a such solenoid is half of that in the middle.
  b)   Evaluate the inductance of a solenoid of 2800 turns wound uniformly over a length 0.6 m on a cylindrical paper tube 4 cm in diameter. The medium is air.   [8+7]

6.a)   State and explain Biot-Savart's Law.
  b)   Determine the force per meter length between two long parallel wires A & B separated by 6 cm in air carrying currents of 42 Amps. (i) In same direction. (ii) In the opposite direction.   [7+8]

7.a)   Write and explain differential and integral form's of Maxwell's equations for fields varying hormonally with time.
  b)   What is displacement current? Explain briefly.   [9+6]

8.a)   Define poynting vector and derive the expression for poynting theorem.
  b)   A plane transverse electromagnetic wave has a power density of 1.2 W/m^2 in a medium with $\varepsilon_r = 3$ and $\mu_r = 1$. Find the amplitudes of electric and magnetic field intensities.
                                                                                          [8+7]

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