

Code :RA07A3EC04

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II B.Tech I Semester(R09) Supplementary Examinations, May 2011

ELECTROMAGNETIC FIELDS
(Electronics & Control Engineering)

(For students of R07 regulation readmitted to II B.Tech I Semester R09)

Time: 3 hours

Max Marks: 70

Answer any FIVE questions
All questions carry equal marks

1. (a) State Coulombs law. Obtain an expression in vector form.
(b) Define the term: "potential difference $V_{AB} = V_A - V_B$ between points A and B in a static electric field. Give an energy interpretation to the potential difference.
2. (a) Find electric potential due to electric dipole.
(b) The potential difference between two concentric sphere of radii r_1 and r_2 ($r_2 > r_1$) is V_1 show that electric field E at the surface of inner sphere is minimum of $2V/r_1$ for $r_1 = r_2/2$.
3. A parallel plate capacitor consists of two square metal plates with 500 mm side and separated by 10 mm. A slab of sulphur ($\epsilon_r = 4$) 6 mm thick is placed on the lower plate and air gap of 4 mm Find capacitance of capacitor.
4. Define the vector magnetic potential A and find A due to a straight long current conductor of length $2L$ meters, located on Z -axis. Hence find H at any point in yz plane.
5. Find the magnetic field and its curl at radius ' r ' within conductor of radius $R \gg r$ carrying current I , uniformly distributed over the cross section. Plot the variation of H and $\Delta \times H$ as a function of radial distance ' r ' from the center of conductor.
6. (a) Derive an expression for force on a differential current element
(b) A conductor of 250cm long carries a current of 25 amps at right angles to a uniform field produced by the pole core of an electrical machine. Now if core has a circular cross section of 140mm diameter and total flux in core is 15m wb, then find
 - i. force developed on the conductor
 - ii. power required moving conductor at a speed of 20m/sec in a plane at right angles to the field?
7. (a) Derive an expression of self inductance of toroid
(b)
 - i. Two coils are wound on a common magnetic circuit of 55 sq cm in cross section and mean length of 120cm. One coil has 90 turns and the other 600. Calculate the mutual inductance of the coils, if the relative permeability of the iron path is 1400.
 - ii. If a current in the 90 turns coil is changing from 4A to zero in 0.01 second, find the induced e.m.f. in the second coil.
8. (a) State and explain the statically and dynamically induced emf's.
(b) An AC voltage source $V = V_0 \sin \omega t$ is connected across a parallel plate capacitor C . Verify that the displacement current in the capacitor is the same as the conduction current in the wire.
