





12. a) i) Find the potential at  $r_A = 1$  m with respect to  $r_B = 2$  m due to point charge  $Q = 10$  nC at the origin and zero reference at infinity. (8)
- ii) Find the capacitance of a parallel plate capacitor with dielectric  $\epsilon_{r1} = 1.5$  and  $\epsilon_{r2} = 3.5$  each occupy one half of the space between the plates of area  $2\text{m}^2$  and  $d = 10^{-3}$  m. (8)
- (OR)
- b) i) In spherical coordinates  $V = -25\text{V}$  on a conductor at  $r = 2$  cm and  $V = 150$  V at  $r = 35$  cm. The space between the conductor is a dielectric of  $\epsilon_r = 3.12$ . Find the surface charge densities on the conductor. (8)
- ii) Derive Laplace and Poisson's equation. (8)
13. a) Derive the expression for magnetic field intensity due to infinitely long straight conductor carrying a current of 1 amp along Z-axis. (16)
- (OR)
- b) i) Determine H for a solid cylindrical conductor of radius a, where the current I is uniformly distributed over the cross section. (8)
- ii) Calculate the inductance of a ring shaped coil of mean diameter 8 mm, wound on a wooden core of 40 mm diameter containing 2500 turns. (8)
14. a) Derive Maxwell's equation in both point and integral form conducting medium and free space. (16)
- (OR)
- b) i) Explain the concept of emf induction in static and time varying magnetic field. (8)
- ii) A parallel plate capacitor with plate area of  $5\text{cm}^2$  and plate separation of 3mm has a voltage  $50 \sin 10^3 t$  V applied to its plates. Calculate the displacement current assuming  $\epsilon = 2 \epsilon_0$ . (8)
15. a) Derive the expression for electromagnetic wave equation for conducting and perfect dielectric medium. (16)
- (OR)
- b) A 9375 MHz uniform plane wave is propagating in a material medium of  $\epsilon_r = 2.56$ . If the amplitude of the electric field intensity of lossless medium is 500V/m. Calculate the phase constant, propagation constant, velocity, wavelength and intrinsic impedance. (16)