BTS – V – 11.14 – 0853 Reg. No. | | | | | | | | |

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B.Tech. Degree V Semester Examination November 2014

EC 1502 ELECTROMAGNETIC THEORY

(*2012 Scheme*)

Time: 3 Hours Maximum Marks: 100

PART A

(Answer *ALL* questions)

(8 × 5 = 40)

I. (a) Given point $P(1,3,5)$ in Cartesian co-ordinate system. Express P in cylindrical and spherical co-ordinates.

(b) Define divergence of a vector field. Explain its physical significance.

(c) State and prove Gauss's law of electrostatics.

(d) Determine the capacitance of a spherical capacitor.

(e) State and explain Biot-Savart's law.

(f) Compare conduction current and displacement current.

(g) Explain skin effect. Derive an expression for skin depth in a good conductor.

(h) Define:
- (i) Propagation constant
- (ii) Intrinsic impedance
- (iii) Loss tangent

PART B

(4 × 15 = 60)

II. (a) The vector $A = a_\rho / \rho$ is defined in cylindrical system. Transform it into rectangular system. Also perform the inverse transformation. (5)

(b) State and prove divergence theorem. (5)

(c) State and prove Stoke's theorem. (5)

OR

III. (a) Define gradient and curl. Enumerate any four properties of each of them. (8)

(b) Given point P(-2, 6, 3) and vector $A = y\, a_x + (x+z)\, a_y$. Express P and A in cylindrical co-ordinates. Evaluate A at P in the cylindrical co-ordinate system. (7)

IV. (a) What is an electric dipole? Derive expressions for electric potential and electric field due to electric dipole. (8)

(b) Derive continuity equation and find an expression for relaxation time. (7)

OR

V. (a) Derive an expression for the capacitance of a coaxial cable having length 'L', inner radius 'a' and outer radius 'b'. (7)

(b) Derive Poisson's and Laplace's equations. (8)

(P.T.O.)

VI.	(a)	State and explain Maxwell's equations in integral and differential form for static fields.	(10)
	(b)	Derive an expression for energy stored in a magnetic field.	(5)
		OR	
VII.	(a)	State and explain Ampere's circuital law.	(5)
	(b)	Differentiate between diamagnetic, paramagnetic and ferromagnetic materials.	(4)
	(c)	Derive an expression for the inductance of a two-wire transmission line with separation distance 'd' and radius of the wire 'a'.	(6)
VIII.	(a)	State and prove Poynting's theorem. Explain its physical significance.	(10)
	(b)	Derive expression for reflection coefficient for reflection of a plane wave at normal incidence.	(5)
		OR	
IX.	(a)	Starting from Maxwell's equations, derive the wave equation for 'H' in free space.	(6)
	(b)	Derive an expression for reflection coefficient and transmission coefficient for an obliquely incident wave having parallel polarization.	(9)

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