Code: 15A04403 **R15**

B.Tech II Year II Semester (R15) Supplementary Examinations December 2018

ELECTROMAGNETIC THEORY & TRANSMISSION LINES

(Electronics & Communication Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) State the relation between electric flux density and electric field intensity.
(b) Obtain Poisson's equation from Gauss's law.
(c) Define magnetic dipole.
(d) Write the expression for inductance of a toroid.
(e) Define displacement current.
(f) Write the Maxwell's equation from ampere's law both in integral and point form.
(g) Define electromagnetic wave.
(h) Mention any two properties of uniform plane wave.
(i) Derive the relationship between SWR and reflection co-efficient.
(j) Find the characteristic impedance of a line at 1600 Hz, if Z_{OC} = 750 ∠-30°Ω and Z_{SC} = 600 ∠-20°Ω.

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 Find the curl of the following vector fields:
(i) $\vec{A} = e^{xy}\overrightarrow{a_x} + \sin(xy)\,\overrightarrow{a_y} + cos^2(xz)\overrightarrow{a_z}$.
(ii) $\vec{B} = \rho z^2\, cos\phi\overrightarrow{a_\rho} + zsin^2\phi\overrightarrow{a_z}$.

OR

3 State and prove Gauss law.

UNIT – II

4 Explain the vector potential and drive its expression.

OR

5 State and prove Biot-Savart law.

UNIT – III

6 Express Maxwell's equations for good conductors.

OR

7 Describe Faraday's disc generator with a neat sketch. Derive the expression for the emf induced.

UNIT – IV

8 Electric field intensity associated with a plane wave traveling in a perfect dielectric medium is given by Ex = 10 sin $(2\pi \times 10^7 t - 0.1\pi z)v/m. \varepsilon_r = 1.$
(i) What is the velocity of propagation?
(ii) Write down the expression for the magnetic field associated with the wave if $\mu = \mu_0$.

OR

9 Derive the generalized wave equation.

UNIT – V

10 Derive the general solution of a transmission line and explain its physical significance.

OR

11 A generator of 1 V, 1000 Hz supplies power to a 100 km open wire line terminated in Z_o having the following line parameters: R = 10.4 Ω/km , L = 0.00367 H/km, G = 0.8 x 10^{-6} mho/km, C = 0.00835 $\mu F/km$. Calculate the characteristic impedance, propagation constant, attenuation and phase constant, velocity of propagation, sending end current, input power.

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