B.TECH SEM – V (2007 COURSE) (ELECTRONICS) : SUMMER - 2018

SUBJECT: ELECTROMAGNETIC ENGINEERING

Day : **Friday** Time: **10.00 AM TO 01.00 PM**
Date : **25/05/2018** Max. Marks: 80.

S-2018-2673

N.B.:

1) Q. No. 1 and Q. No. 5 are **COMPULSORY.** Out of the remaining attempt any **TWO** questions from each section.
2) Both the sections should be written in **SEPARATE** answer books.
3) Figures to the **RIGHT** indicate full marks.
4) Draw neat labeled diagrams **WHEREVER** necessary.
5) Use of non-programmable pocket calculator is **ALLOWED.**

SECTION-I

Q.1 **a)** Explain spherical coordinate system. **(05)**
b) Define Gauss's law. **(05)**
c) Define vector magnetic potential. **(04)**

Q.2 **a)** Express $A=2y\hat{a}_x - z\hat{a}_y + x\hat{a}_z$ in spherical coordinates. **(07)**
b) Find cross product of $A=1\hat{a}_x+3\hat{a}_y+2x\hat{a}_z$ and $B=5\hat{a}_x+4\hat{a}_y+3\hat{a}_z$ in spherical coordinates. **(06)**

Q.3 **a)** A line charge density ρ_L = 20 nC/m is located in free space on line y = 3, x = 4 and a point charge Q = 3 x 10^{-12} C located at origin. **(07)**
Find: i) E due to line charge at P (8, 9, 10)
ii) E due to point charge at P (8, 9, 10).
b) Derive and explain electric potential and potential Gradient. **(06)**

Q.4 **a)** Derive magnetic force for differential current element and point charge. **(07)**
b) Find H at point P(2, 2, 3) due to current filament 16A in $\hat{a}_z$ direction on Z-axis extending from 0 to 6. **(06)**

SECTION-II

Q.5 **a)** Define Displacement current. **(05)**
b) Define loss tangent and its significance. **(05)**
c) Define VSWR and reflection coefficient of transmission line. **(04)**

Q.6 **a)** Derive Maxwells equations in point form and integral form. **(07)**
b) Define Poynting theorem. **(06)**

Q.7 Given a non-magnetic material having ϵ_r = 3.2, σ=1.75 x 10^{-4} S/m, Find the values at 2.5 MHz **(13)**
i) Loss tangent ii) Attenuation constant
iii) Phase constant iv) Intrinsic impedance

Q.8 **a)** Derive TE and TM modes of rectangular waveguide. **(07)**
b) Derive transmission line equations. **(06)**

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