Subject Code: NEC508

PAPER ID-310554

Roll No: | | | | | | | | | | | | | |

B.TECH.
(SEM-V) THEORY EXAMINATION 2020-21
FUNDAMENTAL OF E.M. THEORY

Time: 3 Hours ***Total Marks: 100***

Note: Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. 2 x 10 = 20

a.	What is the physical significance of divergence of a vector field 'A'?
b.	What are equipotential surfaces?
c.	Define skin depth.
d.	List the boundary conditions on electric field in electromagnetism.
e.	Write a short note on characteristic impedance.
f.	Write down the condition for a line to be distortionless.
g.	Define the term phase velocity.
h.	What is Polarization? What are the types of polarization?
i.	Explain Ampere's law.
j.	Define the displacement current.

SECTION B

2. Attempt any *three* of the following: 10x3=30

a.	Given point P(-2,6,3) and vector **A**=$\boldsymbol{ya_x + (x+z)a_y}$**.** Express P and **A** in spherical system.
b.	Find the divergence of given vector function, **A** $\mathbf{A}=\boldsymbol{x^2a_x + (xy)^2a_y + 24(xyz)^2a_z}$**.** Evaluate the volume integral of $\boldsymbol{\nabla . A}$ through the volume of unit cube centered at origin
c.	Write Maxwell's equations in free space for time varying fields both in differential & integral form.
d.	Derive relation between E&H in uniform plane wave propagation and define intrinsic impedance and give its physical significance.
e.	Discuss the reflection of plane wave at the interface of conductor for the normal incidence as well as oblique incidence.

SECTION C

3. Attempt any *one* part of the following: 10x1=10

a.	A charge Q= -10nC is at origin in free space. If x-component of E is to be zero, at the point (3,1,1). What charge Q should be kept at the point (2,0,0) ?
b.	Explain coulomb's law and its importance. Relate force with electric field intensity.

4. Attempt any *one* part of the following: 10x1=10

a.	Develop the concept of displacement current using Maxwell's equations.
b.	Define Poynting vector & derive an expression for poynting theorem.

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5. Attempt any *one* part of the following: 10x1=10

a.	Write Poisson's and Laplace's equations with their significance.
b.	Derive the wave equation along its solution in dielectric medium.

6. Attempt any *one* part of the following: 10x1=10

a.	Define wave impedance. Derive the expression of wave impedance for TM waves that propagate in rectangular waveguide.
b.	Find conduction & displacement current densities in a material having conductivity of 10^{-3} S/m & ε_r= 2.5 if the electric field in the material is E = 5.0 * 10^{-6}sin (9.0 * 10^9 t) V/m.

7. Attempt any *one* part of the following: 10x1=10

a.	Explain the wave between parallel planes. Derive the expression for the attenuation in parallel plane guide.
b.	Let **D**=$2\rho z^2 a_\rho + \rho \cos\varphi \, a_z$. Evaluate (i)$\oint D.ds$ (ii)$\int \nabla.D \, dv$