		Register Number:		……..
B.E DEGREE EXAMINATIONS: NOV/DEC 2012				
Third Semester				
ELECTRICAL AND ELECTRONICS ENGINEERING				
EEE102 **:** Electromagnetic Theory				
Time: Three Hours				**Maximum Marks: 100**
Answer all the Questions:-				
PART A (10 x 1 = 10 Marks)				
1.	The value of permittivity of free space is			
	a)	8.854×10^{-10} F/m	b)	8.854×10^{-11} F/m
	c)	8.854×10^{-12} F/m	d)	8.854×10^{-13} F/m
2.	Differential volume in Cartesian Coordinate system is			
	a)	dx dy dz	b)	dx dy dl
	c)	dy dz ds	d)	dx dz
3.	If the vector $\vec{A}$ and $\vec{B}$ are conservative. then			
	a)	$\vec{A} \times \vec{B}$ is solenoidal	b)	$\vec{A} \times \vec{B}$ is conservative
	c)	$\vec{A} + \vec{B}$ is solenoidal	d)	$\vec{A} - \vec{B}$ is solenoidal
4.	Inside a hollow conducting sphere			
	a)	electric field is zero	b)	electric field is a non zero constant
	c)	electric field charges with the magnitude of the charge given to the conductor	d)	electric field charges with distance from the centre of the sphere
5.	Biot - Savart law states that			
	a)	$dH \propto I\ dl \cos\theta$	b)	$dH \propto I\ dl \sin\theta$
	c)	$dH \propto I\ dl$	d)	$dH \propto dl \sin\theta$
6.	Expression for energy stored in magnetic field is			
	a)	$W = \frac{1}{2} Li$	b)	$W = Li^2$
	c)	$W = 2Li^2$	d)	$W = \frac{1}{2} Li^2$
7.	A circular loop has its radius increasing at a rate of 2 m/s. The loop is placed perpendicular to a constant magnetic field of 0.1 Wb/m^2. When radius of the loop is 2 m, the emf induced in the loop will be			
	a)	0.8 π V	b)	0.4 π V

	c)	0.2 π V	d)	Zero	
8.	Which one of the following sets of equation is independent in Maxwell's equation?				
	a)	The two curl equation	b)	The two divergence equations	
	c)	Both the curl and divergence auditions	d)	The curl equations combined with the continuity equation	
9.	The depth of penetration of a wave in a lossy dielectric increases with increasing				
	a)	Conductivity	b)	Permeability	
	c)	Wavelength	d)	Permittivity	
10.	The intrinsic impedance of copper at high frequencies is				
	a)	Purely resistive	b)	Purely inductive	
	c)	Complex with a capacitive component	d)	Complex with an inductive component	

PART B (10 x 2 = 20 Marks)

11.	Define scalar and vector.
12.	Write the significance of unit vector.
13.	State coulomb's law.
14.	Write the mathematical expression for Poisson's and Laplace's equation.
15.	What is Lorentz force equation?
16.	State ampere's work law.
17.	Differentiate Transformer EMF from motional EMF.
18.	What is meant by displacement current?
19.	Define skin depth.
20.	What you mean by propagation constant.

PART C (5 x 14 = 70 Marks)

21.	a)	i)	Explain Spherical coordinate system and differential elements in spherical coordinate system.	(7)
		ii)	Calculate the total surface area of the cylinder having length , L and radius, R by the method of integration.	(7)
			(OR)	
	b)	i)	State and Prove Divergence Theorem.	(7)
		ii)	Determine the divergence of the following (i) $\vec{P} = x^2 yz\vec{a}_x + xz\vec{a}_z$ (ii) Q = $\rho \sin\phi \vec{a}_\rho + \rho^2 z \vec{a}_\phi + Z\cos\phi \vec{a}_z$	(7)

22.	a)		Four point charges each of 10 μC are placed in free space at the points (1,0,0), (-1,0,0), (0,1,0) and (0,-1,0) m respectively. Determine the force on a point charge of 30 μC located at a point (0,0,1) m.	(14)
			(OR)	
	b)		Derive an expression for Electric Field Intensity due to an uniformly charged infinitely long straight conductor with constant charge density in ρ_ℓ C/m. Assume infinitely long straight conductor is located in Z axis.	(14)
23.	a)		Derive an expression for $\vec{H}$ due to a finite long filament carrying current of 'I'.	(14)
			(OR)	
	b)		With suitable diagrams, derive the boundary conditions between the two magnetic materials having different Permeabilities.	(14)
24.	a)		From the first principle, derive the Maxwell's equation in point form and integral form.	(14)
			(OR)	
	b)	i)	A conductor 2 cm in length is parallel to Z axis and rotates at radians of 25 cm at 1200 rpm. Find induced voltage, if the radial field is given by $\vec{B} = 0.5\ \vec{a}_r$ Tesla.	(7)
		ii)	Compare Circuit Theory and Field Theory.	(7)
25.	a)		Step by step, develop a mathematical equation for an electromagnetic wave propagating in free space.	(14)
			(OR)	
	b)	i)	Derive the Wave equation in lossy and lossless dielectrics.	(7)
		ii)	Derive the equation for Poynting vector from its first principle. Obtain in both point and integral form.	(7)

****