University of Mumbai
Examination 2020

Program: Electronics & Telecommunication Engineering
Curriculum Scheme: Rev2012
Examination: Third Year Semester IV
Course Code: _ETC404____ and Course Name: Wave Theory and Propagation
Time: 1 hour Max. Marks: 50
Note to the students:- All the Questions are compulsory and carry equal marks .

Q1.	Two charges of 1 C are placed in air such that the distance between them is $\sqrt{\{9 * 10^9\}}$. Determine the magnitude of force exerted on each of them
Option A:	2 N
Option B:	1 N
Option C:	0.5 N
Option D:	4 N
Q2.	The relation between electric field and potential is given by (bold letters indicate vectors)
Option A:	$\boldsymbol{E} = \boldsymbol{\nabla V}$
Option B:	$\boldsymbol{E} = -\boldsymbol{\nabla V}$
Option C:	$\boldsymbol{E} = -\boldsymbol{\nabla} \times \boldsymbol{V}$
Option D:	$\boldsymbol{E} = \boldsymbol{\nabla} \times \boldsymbol{V}$
Q3.	A Gaussian sphere has two charges Q_1 and $-Q_2$ inside it while another two charges Q_3 and Q_4 are outside the sphere. Determine the total electric flux density inside the sphere
Option A:	$Q_1 + Q_2 + Q_3 + Q_4$
Option B:	$Q_1 + Q_2$
Option C:	$Q_1 - Q_2$
Option D:	$Q_1 - Q_2 - Q_3 - Q_4$
Q4.	An infinite sheet charge has a charge density of $8.85 * 10^{-12} \frac{C}{m^2}$. Determine the magnitude of electric field at a distance of 1 m above the sheet charge.
Option A:	0.5 V/m
Option B:	2 V/m
Option C:	1 V/m
Option D:	5 V/m
Q5.	Choose the best definition of a dipole.
Option A:	A pair of equal and like charges located at the origin
Option B:	A pair of unequal and like charges located at the origin
Option C:	A pair of equal and unlike charges separated by a small distance
Option D:	A pair of unequal and unlike charges separated by a small distance
Q6.	Calculate the charge density when a potential function $x^2 + y^2 + z^2$ is in air (in nC/m^3)
Option A:	$1/6\pi$
Option B:	$6/2\pi$

Option C:	12/6π
Option D:	10/8π
Q7.	The unit of $\nabla \times H$ is
Option A:	Ampere
Option B:	Ampere/meter
Option C:	Ampere/meter^2
Option D:	Ampere-meter
Q8.	If the tangential component of electric field in medium 1 is 2 V/m, what will be the tangential component of electric field in medium 2? (Assume both the mediums are dielectrics)
Option A:	2 V/m
Option B:	1 V/m
Option C:	-2 V/m
Option D:	0 V/m
Q9.	The skin depth in a poor conductor is independent of
Option A:	permittivity
Option B:	permeability
Option C:	frequency
Option D:	None of these
Q10.	An electromagnetic wave propagating in free space has a magnetic field intensity equal to $H = 0.1\cos(4 * 10^8 t - 2y)a_x \ \ A/m$. What will be total power passing through a square plate of side 20 cm located in the plane x+y=2?
Option A:	0.53 W
Option B:	1.88 W
Option C:	18.8 mW
Option D:	53.31 mW
Q11.	Which of the following statements is an implication of Maxwell's equations?
Option A:	Interdependence of electric and magnetic fields
Option B:	Finite speed of propagation of an electromagnetic wave
Option C:	Light itself is an electromagnetic wave
Option D:	All of the above
Q12.	Which of the following is NOT a Maxwell's equation? (Bold letters indicate vectors)
Option A:	$\boldsymbol{\nabla \cdot B = 0}$
Option B:	$\boldsymbol{\nabla \cdot D = \rho_v}$
Option C:	$\boldsymbol{\nabla \times H = J + \frac{\partial D}{\partial t}}$
Option D:	$\boldsymbol{\nabla \times E = B}$
Q13.	A uniform plane wave incident on a plane surface of a dielectric material is

	reflected with a VSWR of 3. What is the percentage of incident power that is reflected?
Option A:	10 %
Option B:	25 %
Option C:	50 %
Option D:	75 %
Q14.	Name the physical quantity which has the unit C/m^2
Option A:	Electric Field
Option B:	Magnetic Field
Option C:	Magnetic Flux
Option D:	Electric Flux Density
Q15.	A uniform plane wave incident on a plane surface of a dielectric material is reflected with a VSWR of 3. What is the percentage of incident power that is reflected?
Option A:	10 %
Option B:	25 %
Option C:	50 %
Option D:	75 %
Q16.	The static form of continuity equation proves the
Option A:	Kirchoff's Current Law
Option B:	Kirchoff's Voltage Law
Option C:	Both
Option D:	None of the above
Q17.	Magnetic field intensity $= 3\,a_x + 7ya_y + 2xa_z\,A/m$. What is the current density J
Option A:	$-2\,a_y$
Option B:	$-7\,a_z$
Option C:	$3\,a_x$
Option D:	$12\,a_y$
Q18.	Which of the following is not a correct statement regarding boundary condition for a dielectric-dielectric interface?
Option A:	Tangential component of electric field is always continuous at the boundary
Option B:	Normal component of magnetic flux density is always continuous at the boundary
Option C:	Tangential component of magnetic field is continuous at the boundary in the absence of current density
Option D:	Normal component of electric flux density is always continuous at the boundary
Q19.	If the volume charge density is $8.85 \times 10^{-12}\,C/m^3$, the right-hand side of Poisson's equation will be (Assume permittivity of free space as 1)
Option A:	1
Option B:	-1

Option C:	2
Option D:	-2
Q20.	Which of the following is a co-ordinate system?
Option A:	Cartesian
Option B:	Cylindrical
Option C:	Spherical
Option D:	All of the above
Q21.	In general, the earth will act as a ----------
Option A:	leaky resistor
Option B:	leaky inductor
Option C:	leaky capacitor
Option D:	leaky transistor
Q22.	Maximum usable frequency of an ionospheric layer at 60 degrees incidence and 8 MHz critical frequency is
Option A:	9.24 MHz
Option B:	16 MHz
Option C:	8 MHz
Option D:	6.93 MHz
Q23.	Which of the following are types of radio wave propagation?
Option A:	Space Wave Propagation
Option B:	Ground Wave Propagation
Option C:	Surface Wave Propagation
Option D:	All of the above
Q24.	The upper part of the atmosphere where the ionisation is appreciable is known as
Option A:	Stratosphere
Option B:	Ionosphere
Option C:	Troposphere
Option D:	Mesosphere
Q25.	F_2 layer of Appleton region acts as a significant reflecting medium for _____ frequency radio waves
Option A:	Moderate
Option B:	High
Option C:	low
Option D:	Ultra high