University of Mumbai
Examination 2020

Examinations Commencing from 7th January 2021 to 20th January 2021

Program: **Electronics and Telecommunication Engineering**

Curriculum Scheme: Rev2016

Examination: TE Semester V

Course Code: _ECC503____ and Course Name: _Electromagnetic Engineering___

Time: 2 hour Max. Marks: 80

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Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	Which of the following is an example of a transmission line?
Option A:	Coaxial cable
Option B:	Twisted pair cable
Option C:	Optical fiber cable
Option D:	All of the above
2.	If a normal Smith chart is rotated by 180 degrees, we get
Option A:	ZY Smith chart
Option B:	Impedance Smith chart
Option C:	Admittance Smith chart
Option D:	Black Magic Design
3.	A transmission line has R = 0.1 ohms/m, G = 0.01 mho/m, L = 0.01 $\mu H/m$, C = 100 pF/m. Find the characteristic impedance of the line at 2 GHz
Option A:	100+j0.716 ohms
Option B:	100+j0.716 ohms/m
Option C:	10+j0.0358 ohms
Option D:	10+j0.0358 ohms/m
4.	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
5.	The relation between electric field and potential is given by (bold letters indicate vectors)
Option A:	$\boldsymbol{E = \nabla V}$
Option B:	$\boldsymbol{E = -\nabla V}$
Option C:	$\boldsymbol{E = -\nabla \times V}$
Option D:	$\boldsymbol{E = \nabla \times V}$
6.	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:	$Q_1 - Q_2 - Q_3 - Q_4$
7.	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
8.	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
9.	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:	$12/6\pi$
Option D:	$10/8\pi$
10.	The unit of $\nabla \times H$ is
Option A:	Ampere
Option B:	Ampere/meter
Option C:	$Ampere/meter^2$
Option D:	Ampere-meter
11.	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
12.	The skin depth in a poor conductor is independent of
Option A:	permittivity
Option B:	permeability
Option C:	frequency
Option D:	None of these
13.	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
14.	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
15.	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:	$\boldsymbol{\nabla \times H} = \boldsymbol{J} + \frac{\boldsymbol{\partial D}}{\boldsymbol{\partial t}}$
Option D:	$\boldsymbol{\nabla \times E} = \boldsymbol{B}$
16.	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 %
17.	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
18.	Transit time effect is dominant
Option A:	When the frequency is low
Option B:	When the frequency is high
Option C:	When the length of the transmission line is high enough
Option D:	Both b and c
19.	Which of the following is a result of transit time effect at high frequencies?
Option A:	KVL and KCL cannot be applied
Option B:	KVL and KCL can be applied easily
Option C:	Potential along the transmission line is same at all points
Option D:	None of the above
20.	Reflection coefficient is defined as the ratio of
Option A:	Forward travelling wave to the backward travelling wave
Option B:	Backward travelling wave to the forward travelling wave
Option C:	Forward standing wave to the backward standing wave
Option D:	Backward standing wave to the forward standing wave

Q2	**Solve any Two Questions out of Three** **10 marks each**
A	Derive an expression for electric field intensity due to infinite line charge
B	Given V= $2x^2y$-5xz, find V, E, D and ρ_v at P (-4, 3, 6) m
C	Calculate input impedance of a lossless transmission line terminated by a load impedance of 100+j100 ohms and having a characteristic impedance of 50 ohms. The operating frequency is 3 GHz. Assume length as 0.35 lambda

Q3	**Solve any Two Questions out of Three** **10 marks each**
A	Obtain the Poisson's and Laplace's equations used to solve boundary problems for conducting plates described as V (z=0) – 0 V and V (z=2 mm) = 50 V Determine V, **D**, **E**
B	Derive Maxwell's equations in integral and point form for static fields.
C	A media has the following properties $\varepsilon_r = 1; \mu_r = 1; \sigma = 10^{-4}\frac{mho}{m}$ at 1GHz. Determine propagation constant, attenuation constant in dB, wavelength, refractive index, loss tangent. Is the medium behaving like a conductor or a dielectric?