University of Mumbai
Examination 2020

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

Program: **Electronics Engineering**

Curriculum Scheme: Rev2016

Examination: TE Semester V

Course Code: _ELX503____ and Course Name: _ Engineering Electromagnetics___

Time: 2 hour Max. Marks: 80

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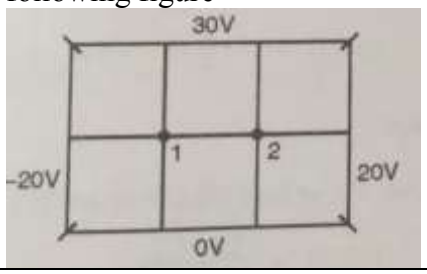
Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	Which of the following is an example of a transmission line?
Option A:	Coaxial cable
Option B:	Twisted pair cable
Option C:	Optical fiber cable
Option D:	All of the above
2.	If a normal 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.	A quarter wave monopole antenna operates at 25 MHz. The length of antenna is
Option A:	3 m
Option B:	48 m
Option C:	6 m
Option D:	12 m
12.	As the aperture area of an antenna increases, its gain
Option A:	increases
Option B:	reduces
Option C:	remains same
Option D:	unpredictable
13.	An antenna has uniform radiation intensity in all directions. The directivity of the antenna is
Option A:	1
Option B:	0
Option C:	0.5
Option D:	0.25

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.	FDM uses which of the following equations
Option A:	Maxwell's equations
Option B:	Laplace's equation
Option C:	Current Continuity equation
Option D:	Poisson's equation
19.	Using Finite Difference Method, calculate the potentials at nodes 1 and 2 for the following figure 
Option A:	6 V, 14 V
Option B:	14 V, 6 V
Option C:	3 V, 7 V
Option D:	7 V, 3 V
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	Compare FDM, FEM and MOM
B	Derive Maxwell's equations in integral and point form for static field
C	Explain sky wave propagation. Calculate the skip distance for flat earth with MUF of 20 MHz if the wave is reflected from a height of 200 km where the maximum value of refractive index of the earth is 0.95