قائمة الاسئلة

نظرية المجالات الكهرومغناطيسية 2- كلية الهندسة - قسم الكهرباء- المستوى الثالث - ...التخصص.اتصالات.- ..الزمن..ثلاث ساعات. - درجة هذا الاختبار

د. محمد المخلافي

1)

The concept of displacement current was a major contribution attributed to	
a.	Faraday
b.	Lenz
c.	Maxwell
d.	Lorenz

1) - a
2) - b
3) + c
4) - d

2)

The flux through each turn of a 100-turn coil is $\varphi = t^3 - 2t$ mWb, where t is in seconds. The induced emf at $t = 2$ s is	
a.	1 V
b.	−1 V
c.	4 mV
d.	−0.4 V

1) - a
2) + b
3) - c
4) - d

3)

Identify which of the following expression is not Maxwell's equation for time-varying fields:	
a.	$\nabla \cdot \mathbf{D} = \rho_v$
b.	$\oint_L \mathbf{H} \cdot d\mathbf{L} = \int_s \left(\sigma \mathbf{E} + \varepsilon \frac{\partial \mathbf{E}}{\partial t}\right) \cdot d\mathbf{S}$
c.	$\nabla \times \mathbf{E} = -\frac{\partial \mathbf{B}}{\partial t}$
d.	$\nabla \cdot \mathbf{E} = -\frac{\partial \mathbf{B}}{\partial t}$

1) - a
2) - b
3) - c
4) + d

4)

If $\mathbf{E}_s = 10e^{j4x}\mathbf{a}_y$, which of these is not a correct representation of $\mathbf{E}$?	
a.	$10\ \sin(\omega t + 4x)\mathbf{a}_y$
b.	$10\ \cos(\omega t + j4x)\mathbf{a}_y$
c.	$\mathrm{Re}(\mathbf{E}_s e^{j\omega t})$
d.	$\mathrm{Im}(\mathbf{E}_s e^{j\omega t})$

1) - a
2) + b
3) - c

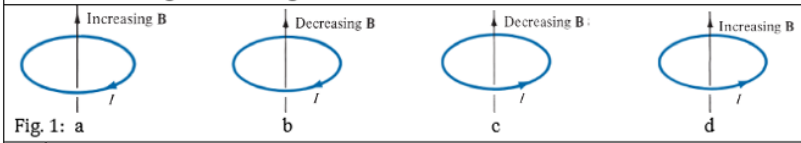
4) - d

5)

A loop is rotating about the y-axis in a magnetic field = $B_o \sin \omega t \, \mathbf{a}_x$ Wb/m^2. The voltage induced in the loop is due to	
a.	Motional emf
b.	Transformer emf
c.	A combination of motional and transformer emf
d.	None of the above

1) - a
2) - b
3) + c
4) - d

6)

Assuming that each loop is stationary and the time-varying magnetic field B induces current I, which of the configurations in Fig. 1 are incorrect?	
 Fig. 1: a b c d	
a.	a and b
b.	b and c
c.	b and d
d.	c and d

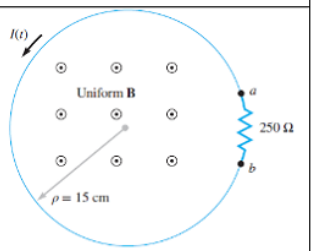
1) - a
2) - b
3) + c
4) - d

7)

A conducting circular loop of radius 20 cm lies in the z = 0 plane in a magnetic field B = 10 cos 377t a_z mWb/m^2. The induced voltage in the loop	
a.	0.4738 sin 377t V
b.	0.0334 sin 377t V
c.	0.474 cos 377t V
d.	0.09 cos 377t V

1) + a
2) - b
3) - c
4) - d

8)

In Fig. 2, let B = 0.2 cos 120πt T, and assume that the conductor joining the two ends of the resistor is perfect. It may be assumed that the magnetic field produced by I(t) is negligible. The voltage $V_{ab}(t)$ and the current I(t) are	
a.	$V_{ab}(t) = -6.33 \cos 120\pi t$, $I(t) = 22.3 \sin 120\pi t$ mA
b.	$V_{ab}(t) = -2.33 \sin 120\pi t$, $I(t) = 16.3 \cos 120\pi t$ mA
c.	$V_{ab}(t) = -5.33 \sin 120\pi t$ V, $I(t) = 21.3 \sin 120\pi t$ mA
d.	$V_{ab}(t) = -4.33 \cos 120\pi t$ V, $I(t) = 20.3 \cos 120\pi t$ mA
 Fig. 2	

1) - a

2) - b
3) + c
4) - d

9)

A lossless transmission line is 80 cm long and operates at a frequency of 600 MHz. The line parameters are $L = 0.25$ μH/m and $C = 100$ pF/m. The characteristic impedance, the phase constant, and the phase velocity are	
a.	$Z_o = 70\ \Omega, \beta = 16.85$ rad/m, $v_p = 2.3 \times 10^8$ m/s
b.	$Z_o = 50\ \Omega, \beta = 18.85$ rad/m, $v_p = 2 \times 10^8$ m/s
c.	$Z_o = 75\ \Omega, \beta = 15.85$ rad/m, $v_p = 2.5 \times 10^8$ m/s
d.	$Z_o = 50\ \Omega, \beta = 18.85$ rad/m, $v_p = 3 \times 10^8$ m/s

1) - a
2) + b
3) - c
4) - d

10)

For a lossy transmission line, the characteristic impedance does not depend on	
a.	The operating frequency of the line
b.	The conductivity of the conductors
c.	The length of the line
d.	The dielectric separating the conductors

1) - a
2) - b
3) + c
4) - d

11)

Which of these is not true of a lossless line?	
a.	$Z_{in} = jZ_o \tan \beta l$ for a shorted line.
b.	$Z_{in} = jZ_o$ for a shorted line with $l = \lambda/8$.
c.	$Z_{in} = Z_o$ for a matched line.
d.	$Z_{in} = jZ_o$ for an open line with $l = \lambda/2$.

1) - a
2) - b
3) - c
4) + d

12)

A lossless transmission line of length 50 cm with $L = 10$ μH/m and $C = 40$ pF/m is operated at 100 MHz. Its electrical length is	
a.	360°
b.	720°
c.	180°
d.	90°

1) - a
2) + b
3) - c
4) - d

13)

The tangential component of an electric field will be continuous in which boundary?	
a.	Conductor-Conductor
b.	Conductor-Dielectric
c.	Dielectric-Dielectric
d.	Any boundary

1) - a
2) - b
3) - c
4) + d

14)

Magnetic field can be produced by	
a.	Conduction current
b.	Displacement current
c.	Both conduction and displacement current
d.	It is produced naturally

1) - a
2) - b
3) + c
4) - d

15)

In the electromagnetic waves , the average energy density associated with the magnetic field is given by	
a.	$1/2\ (\mu_o B^2)$
b.	$1/2\ (B^2/\mu_o)$
c.	$1/2\ (\varepsilon_o B^2)$
d.	$1/2\ (B^2/\varepsilon_o)$

1) - a
2) + b
3) - c
4) - d

16)

Which of the following statements is not true of the line parameters R, L, G, and C?	
a.	R and L are series elements
b.	G and C are shunt elements
c.	$G = 1/R$
d.	The parameters are not lumped but distributed

1) - a
2) - b
3) + c
4) - d

17)

The condition that holds good in a distortionless transmission line is	
a.	$RL = GC$
b.	$R/L = G/C$
c.	L/R = G/C
d.	None of the above

1) - a
2) + b
3) - c
4) - d

18)

A distortionless line has L =333 nH/m and C = 92.59 pF/m, $u = 0.6c$, where c is the speed of light in a vacuum. The characteristic impedance Z_o of the line is	
a.	80 Ω
b.	50 Ω
c.	60 Ω
d.	40 Ω

1) - a
2) - b
3) + c
4) - d

19)

For the wave equation $\mathbf{E} = 10 \sin(\omega t - 5z)\mathbf{a}_x$, the wave propagation will be in the direction of	
a.	x direction
b.	z direction
c.	$-z$ direction
d.	$-x$ direction

1) - a
2) + b
3) - c
4) - d

20)

A Maxwell's equation for electromagnetic waves in free space is	
a.	$\nabla \times \mathbf{H} = j\omega\mu_o\mathbf{H}$
b.	$\nabla \times \mathbf{E} = -j\omega\varepsilon_o\mathbf{E}$
c.	$\nabla \times \mathbf{H} = -j\omega\mu_o\mathbf{H}$
d.	$\nabla \times \mathbf{E} = -j\omega\mu_o\mathbf{H}$

1) - a
2) - b
3) - c
4) + d

21)

Maxwell's equations give the relations between	
a.	Different fields
b.	Different boundary conditions
c.	Different sources
d.	None of the above

1) + a
2) - b
3) - c
4) - d

22)

Differential form of Gauss's law in magneto statics is	
a.	div $\mathbf{B} = \rho/\varepsilon_o$
b.	div $\mathbf{B} = -$ dB/dt
c.	div $\mathbf{B} = 0$
d.	div $\mathbf{B} = \mu J$

1) - a
2) - b
3) + c
4) - d

23)

In free space, $\mathbf{E} = 20\cos(\omega t - 50x)\mathbf{a}_y$ V/m. the displacement current density J_d is	
a.	$-20\omega\varepsilon_o \sin(\omega t - 50x)\mathbf{a}_y$ A/m^2
b.	$20\omega\varepsilon_o \cos(\omega t - 50x)\mathbf{a}_y$ A/m^2
c.	$20\omega\varepsilon_o \sin(\omega t + 50x)\mathbf{a}_y$ A/m^2
d.	$-20\omega\varepsilon_o \cos(\omega t - 50x)\mathbf{a}_y$ A/m^2

1) + a
2) - b
3) - c
4) - d

24)

Which of the following statements is not true of a phasor?	
a.	It is a time-dependent quantity
b.	It may be a scalar or a vector
c.	A phasor V_s may be represented as $V_o \angle\theta^\circ$ where $V_o = \lvert V_s \rvert$
d.	It is a complex quantity

1) + a
2) - b
3) - c
4) - d

25)

Consider a transmission line of length l, characterized by γ and Z_o, connected to a load Z_L as shown in Fig. 3. If the input impedance at the input terminals is $Z_{in} = 60.25 + j38.79\ \Omega$ and the line is connected to a source of $10\angle 0^\circ$ V, $Z_g = 40\ \Omega$, the input current I_o and the input voltage V_o are

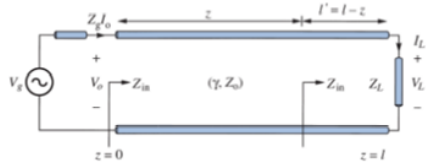


Fig. 3

a.	$63.03\angle -24.15^\circ$ mA and $6.667\angle 11.62^\circ$ V
b.	$93.03\angle -21.15^\circ$ mA and $6.667\angle 11.62^\circ$ V
c.	$93.03\angle -21.15^\circ$ mA and $9.997\angle 15.62^\circ$ V
d.	$99.03\angle -21.15^\circ$ mA and $4.967\angle 16.62^\circ$ V

1) - a
2) + b
3) - c
4) - d

26)

A transmission line has parameter constants R, L, G and C, and characteristic impedance Z_o and propagation constant $\gamma\ (= \alpha + j\beta)$. If the line is lossless, then

a.	$R = 0, G \neq 0$ and $\alpha = 0$
b.	$R = 0, G = 1/R$ and $\sigma \neq 0$
c.	$R = 0, G = 0, \sigma_c \neq \infty$ and $\sigma \neq 0$
d.	$R = 0, G = 0, \alpha = 0, \sigma_c \approx \infty$ and $\sigma \approx 0$

1) - a
2) - b
3) - c
4) + d

27)

A transmission line has a VSWR, s = 2, reflection coefficient Γ is

a.	1/4
b.	0
c.	1/3
d.	1/2

1) - a
2) - b
3) + c
4) - d

28)

The electric field of a uniform plane electromagnetic wave in free space, along the positive direction, is given by $\boldsymbol{E} = 10\,(\boldsymbol{a}_y + j\boldsymbol{a}_z)e^{-j25x}$. The frequency and polarization of the wave, respectively are

a.	4 GHz, left circular
b.	1.2 GHz, left circular
c.	1.2 GHz, right circular
d.	4 GHz, right circular

1) - a
2) + b
3) - c
4) - d

29)

A lossless transmission line with $Z_o = 50\ \Omega$ and operates at 2 MHz. The line is terminated with a load $Z_L = 60 + j40\ \Omega$. The reflection coefficient Γ is	
a.	$0.3523\angle 56^\circ$
b.	$0.6523\angle 66^\circ$
c.	$0.1523\angle 56^\circ$
d.	$0.4523\angle 50^\circ$

1) + a
2) - b
3) - c
4) - d

30)

A lossless transmission line with $Z_o = 50\ \Omega$ and operates at 2 MHz. The line is terminated with a load $Z_L = 60 + j40\ \Omega$. The standing wave ratio s is	
a.	5.012
b.	4.895
c.	3.998
d.	2.088

1) - a
2) - b
3) - c
4) + d

31)

A telephone line has $R = 30\ \Omega$/km, $L = 100$ mH/km, $G = 0$, and $C = 20\ \mu$F/km. At $f = 1$ kHz, the characteristic impedance of the line and the propagation constant are	
a.	$7.7 - j1.6$ and $2.1\times 10^{-5} + j8.8 \times 10^{-4}$ / m
b.	$70.73 - j1.688$ and $2.121\times 10^{-4} + j8.888 \times 10^{-3}$ / m
c.	70.73 and 2.121×10^{-4} / m
d.	None of the above

1) - a
2) + b
3) - c
4) - d

32)

The transmission line is said to be lossless when the conductor is	
a.	Perfect and dielectric is lossless
b.	Perfect and dielectric is lossy
c.	Imperfect and dielectric is lossy
d.	Imperfect and dielectric is lossless

1) + a
2) - b
3) - c
4) - d

33)

Which two parameters given below are zero in the lossless line?	
a.	L, C
b.	C, G
c.	G, α
d.	R, L

1) - a
2) - b
3) + c
4) - d

34)

The input impedance of a short circuited 50 Ω coaxial line with $\beta = 8.5$ rad/m when line length is $\lambda/8$ is	
a.	$j164.08\ \Omega$
b.	$j9.29\ \Omega$
c.	$j50\ \Omega$
d.	$j20.93\ \Omega$

1) - a
2) - b
3) + c
4) - d

35)

The coaxial cable are used in	
a.	Telephone cables transmission
b.	Short wave transmission
c.	Power transmission
d.	Television signal transmission

1) - a
2) - b
3) - c
4) + d