قائمة الاسئلة

نظرية المجالات كلية الهندسة - قسم الكهرباء- المستوى الثالث - ...التخصص.حاسبات.- ..الزمن.ثلاث ساعات. - درجة هذا الاختبار (60)

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1)

The electric field lines and equipotential lines	
a.	Are parallel to each other
b.	Are one and the same
c.	Cut each other orthogonally
d.	Can be inclined to each other at any angle

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

2)

A field is given as $\boldsymbol{F} = y\boldsymbol{a}_x + z\boldsymbol{a}_y + x\boldsymbol{a}_z$. The angle between $\boldsymbol{F}$ and $\boldsymbol{a}_x$ at point (3, 4, 0) is	
a.	30.78°
b.	36.87°
c.	46.12°
d.	90°

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

3)

Which of these is correct?	
a.	$\mathbf{A} \times \mathbf{A} = \|\mathbf{A}\|^2$
b.	$\mathbf{A} \times \mathbf{B} + \mathbf{B} \times \mathbf{A} = \mathbf{0}$
c.	$\mathbf{A} \cdot \mathbf{B} \cdot \mathbf{C} = \mathbf{B} \cdot \mathbf{C} \cdot \mathbf{A}$
d.	$\mathbf{a}_k = \mathbf{a}_x - \mathbf{a}_y$, where $\mathbf{a}_k$ is a unit vector

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

4)

The vector projection of $\mathbf{A} = 6\mathbf{a}_x + 2\mathbf{a}_y - 3\mathbf{a}_z$ along $3\mathbf{a}_x - 4\mathbf{a}_y$ is	
a.	$6\mathbf{a}_x - 8\mathbf{a}_y$
b.	$18\mathbf{a}_x - 8\mathbf{a}_y$
c.	$1.2\mathbf{a}_x - 1.6\mathbf{a}_y$
d.	$12\mathbf{a}_x - 16\mathbf{a}_y$

1)	-	a

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

5)

Let $\mathbf{F} = 2\mathbf{a}_x - 6\mathbf{a}_y + 10\mathbf{a}_z$ and $\mathbf{G} = \mathbf{a}_x + G_y\mathbf{a}_y + 5\mathbf{a}_z$. If $\mathbf{F}$ and $\mathbf{G}$ have the same unit vector, G_y is	
a.	-6
b.	6
c.	-3
d.	3

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

6)

Given $\mathbf{A} = \mathbf{a}_x + 3\mathbf{a}_z$ and $\mathbf{B} = 5\mathbf{a}_x + 2\mathbf{a}_y - 6\mathbf{a}_z$. The angle θ_{AB} is	
a.	120.66°
b.	83.73°
c.	64.44°
d.	93.43°

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

7)

At Cartesian point $(-3, 4, -1)$, which of these is incorrect?	
a.	$\rho = 5$
b.	$r = \sqrt{20}$
c.	$\theta = \tan^{-1}\frac{5}{-1}$
d.	$\Phi = \tan^{-1}\frac{4}{-3}$

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

8)

The three vertices of a triangle are located at $A = (6, -1, 2)$, $B = (-2, 3, -4)$, and $C = (-3, 1, 5)$. The area of the triangle is	
a.	17
b.	35
c.	84
d.	42

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

9)

Point charges $Q_1 = 1$ nC $Q_2 = 2$ nC are at a distance apart. Which of the following statements is incorrect?	
a.	The force on Q_1 is repulsive.
b.	The force on Q_2 is the same in magnitude as that on Q_1.
c.	As the distance between them decreases, the force on Q_1 increases linearly.
d.	The force on Q_2 is along the line joining them.

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

10)

What happens to the attraction force between the plates of a capacitor when the separation distance between the plates increases?	
a.	Remains the same
b.	Decreases
c.	Increases
d.	Becomes zero

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

11)

An infinite plane at $z = 10$ m carries charge 20 nC/m². The electric field intensity at the origin is	
a.	$-10\ \mathbf{a}_z$ V/m
b.	$-18\pi\ \mathbf{a}_z$ V/m
c.	$-72\pi\ \mathbf{a}_z$ V/m
d.	$-360\pi\ \mathbf{a}_z$ V/m

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

12)

Point charges 30 nC, -20 nC, and 10 nC are located at $(-1, 0, 2)$, $(0, 0, 0)$, and $(1, 5, -1)$, respectively. The total flux leaving a cube of side 6 m centered at the origin is	
a.	-20 nC
b.	10 nC
c.	20 nC
d.	30 nC

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

13)

The flow of charge per unit time defines	
a.	Power
b.	Current
c.	Voltage
d.	Current displacement

1) - a

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

14) What is the magnitude of the electric field at point P due to the two charges shown in Fig. 1?

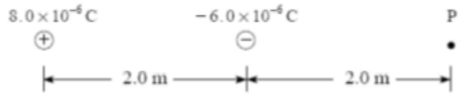

Fig. 1

a.	4.5×10^{3} V/m
b.	9.0×10^{3} V/m
c.	1.4×10^{4} V/m
d.	1.8×10^{4} V/m

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

15) How much work is needed to move a -2.0×10^{-6} C charge from position S to position T as shown in Fig. 2?

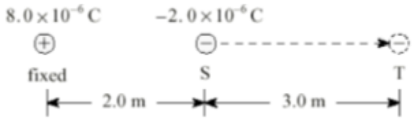

Fig. 2

a.	4.3×10^{-2} J
b.	9.0×10^{3} J
c.	9.1×10^{-2} J
d.	1.1×10^{-1} J

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

16) In the diagram shown in Fig. 3, a 2.0×10^{-6} C charge experiences forces of 3.0 N and 8.0 N at its location between charges Q_1 and Q_2. Find the magnitude of the net electric field strength at the location of the 2.0×10^{-6} C charge.

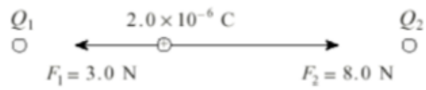

Fig. 3

a.	2.5×10^{6} V/m
b.	3.8×10^{6} V/m
c.	5.5×10^{6} V/m
d.	1.2×10^{6} V/m

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

17) An electric potential field is produced by point charges 1 μC and 4 μC located at (− 2, 1, 5) and (1, 3, − 1), respectively. The energy stored in the field is

a.	2.57 mJ
b.	5.14 mJ
c.	10.28 mJ
d.	None of the above

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

18)

The magnetic field at a point R distance away from infinitely long wire carrying electric current I A is	
a.	$I/2\pi R$ A/m
b.	$I/4\pi R^2$ A/m
c.	$I/4\pi R$ A/m
d.	$I/2\pi\mu_0 R$ A/m

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

19)

The z-axis carries filamentary current of 10π A along $\mathbf{a}_z$. Which of these is incorrect?	
a.	$\mathbf{H} = -\mathbf{a}_x$ A/m at $(0, 5, 0)$
b.	$\mathbf{H} = \mathbf{a}_\varphi$ A/m at $(5, \pi/4, 0)$
c.	$\mathbf{H} = -0.8\mathbf{a}_x - 0.6\mathbf{a}_y$ A/m at $(-3, 4, 0)$
d.	$\mathbf{H} = -\mathbf{a}_\varphi$ A/m at $(5, 3\pi/2, 0)$

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

20)

Identify the configuration in Fig. 4 that is not a correct representation of I and **H**.

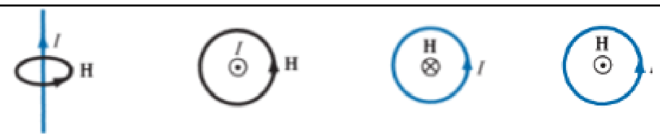

Fig. 4: (a) (b) (c) (d)

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

21)

What is the magnetic field outside a solenoid?	
a.	Half the value of the field inside
b.	Infinity
c.	Double the value of the field inside
d.	Zero

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

22)

A rectangular loop carrying 10 A of current is placed on $z = 0$ plane as shown in Fig. 5. The magnetic field intensity **H** at P (4, 2, 0) is

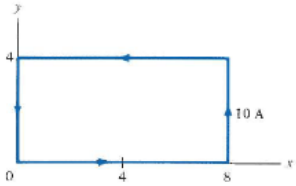

Fig. 5

a.	$\mathbf{H} = 1.78\,\mathbf{a}_z$ A/m
b.	$\mathbf{H} = -1.78\,\mathbf{a}_z$ A/m
c.	$\mathbf{H} = 0.78\,\mathbf{a}_z$ A/m
d.	$\mathbf{H} = 1.78\,\mathbf{a}_y$ A/m

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

23)

The x-axis carries filamentary current of 10π A along $\mathbf{a}_x$. The magnetic field **H** at P (0, 2 , 0) is	
a.	$\mathbf{H} = -2.5\,\mathbf{a}_z$ A/m
b.	$\mathbf{H} = 2.5\,\mathbf{a}_z$ A/m
c.	$\mathbf{H} = 10\pi\,\mathbf{a}_y$ A/m
d.	$\mathbf{H} = \mathbf{a}_z$ A/m

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

24)

Two identical loops are parallel and separated by distance d as shown in Fig. 6. The magnetic field **H** at $(0, 0, d/2)$ is

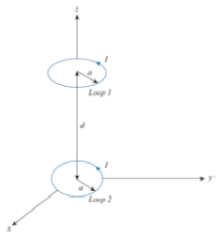

Fig. 6

a.	Zero
b.	$\frac{Ia^2}{(a^2+0.25d^2)^{1.5}}\,\boldsymbol{a}_\varphi$ A/m
c.	$\frac{Ia^2}{(a^2+0.25d^2)^{1.5}}\,\boldsymbol{a}_z$ A/m
d.	$\frac{2Ia}{(a^2+0.25d^2)^{1.5}}\,\boldsymbol{a}_z$ A/m

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

25)

Plane y = 0 carries a uniform current of $30\mathbf{a}_z$ mA/m. At (1, 10, −2), the magnetic field intensity is	
a.	$\mathbf{H} = -15\mathbf{a}_x$ mA/m
b.	$\mathbf{H} = 15\mathbf{a}_x$ mA/m
c.	$\mathbf{H} = 20\mathbf{a}_y$ nA/m
d.	None of the above

1) + a

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

26)

An infinitely long coaxial cable has inner radius a = 5 mm, outer radius b = 8 mm, as shown in Fig. 7. The magnetic field inside the inner conductor ($\rho < a$) and between the two conductors ($a < \rho < b$) is

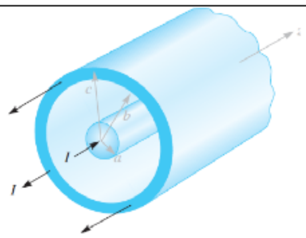

Fig. 7

a.	$\mathbf{H} = \frac{Ia}{2\pi\rho}\boldsymbol{a}_\varphi$ and $\mathbf{H} = \frac{I}{2\pi\rho}\boldsymbol{a}_\varphi$
b.	$\mathbf{H} = \frac{-I\rho}{2\pi a}\boldsymbol{a}_\varphi$ and $\mathbf{H} = \frac{-I}{2\pi\rho}\boldsymbol{a}_\varphi$
c.	$\mathbf{H} = \frac{I\rho}{2\pi a^2}\boldsymbol{a}_\varphi$ and $\mathbf{H} = \frac{I}{2\pi\rho}\boldsymbol{a}_\varphi$
d.	None of the above

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

27)

Planes z = 0 and z = 4 carry current $\mathbf{K} = -10\boldsymbol{a}_x$ A/m and $\mathbf{K} = 10\boldsymbol{a}_x$ A/m, respectively, as shown in Fig. 8. The magnetic field **H** at (1, 1, 1) and (0, -3, 10) is

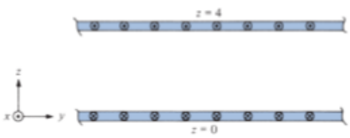

Fig. 8

a.	$\mathbf{H} = 10\boldsymbol{a}_y$ A/m and $\mathbf{H} = 0$ A/m
b.	$\mathbf{H} = 10\boldsymbol{a}_y$ A/m and $\mathbf{H} = 5\boldsymbol{a}_y$ A/m
c.	$\mathbf{H} = -10\boldsymbol{a}_y$ A/m and $\mathbf{H} = 0$ A/m
d.	$\mathbf{H} = 10\boldsymbol{a}_y$ A/m and $\mathbf{H} = -5$ A/m

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

28)

If the static electric field **E** and its density is **D** then

a.	$\nabla \times \mathbf{E} = \mathrm{Q}$
b.	$\nabla \cdot \mathbf{D} = 0$
c.	$\nabla \cdot \mathbf{D} = \rho_v$
d.	$\nabla \times \mathbf{D} = \rho_v$

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

29)

The operator 'del' (∇) is a	
a.	Vector space function
b.	Vector time function
c.	Scalar space function
d.	Vector time function

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

30)

For the potential distribution, $V = 2x^2 + 4y^2$, the electric field intensity and the volume charge distribution (assume free space) are	
a.	$\mathbf{E} = -4x\boldsymbol{a}_x - 8y\boldsymbol{a}_y$ and $\rho_v = -10\ \mathrm{pC/m^3}$
b.	$\mathbf{E} = 4x\boldsymbol{a}_x + 8y\boldsymbol{a}_y$ and $\rho_v = -10.25\ \mathrm{pC/m^3}$
c.	$\mathbf{E} = 4x\boldsymbol{a}_x + 8y\boldsymbol{a}_y$ and $\rho_v = 106.25\ \mathrm{pC/m^3}$
d.	$\mathbf{E} = -4x\boldsymbol{a}_x - 8y\boldsymbol{a}_y$ and $\rho_v = -106.25\ \mathrm{pC/m^3}$

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