Faculty of Computers & Artificial Intelligence

1st Term (January 2020) Final Exam
Information Security and Digital Forensics Program
Networking and Mobile Technologies Program
Course Code: FBS121, NBS121 **Level:** 1st level
Subject: Physics

Benha University

Date: 16/01/2020
Time: 2 Hours
Total Marks: 50 Marks
Examiner(s): Dr. **Salah Hamza**

Choose the correct answer and shaded its circle in the answer sheet.

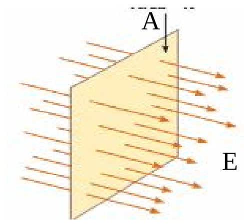

Fig. 1

1. The magnitude of $\vec{A}$ and $\vec{B}$ are 12 units and 8 units. The largest and smallest values for $\vec{R} = \vec{A} + \vec{B}$ are: (a) 14.4 and 8 (b) 10 and 5 (c) 20 and 4.
2. In Fig. 1 the electric field $E = 5\,NC^{-1}$ then the electric flux through the area $A = 4\,m^2$ is (a) $20\,Nm^2C^{-1}$ (b) $10\,Nm^2C^{-1}$ (c) $0\,Nm^2C^{-1}$
3. The units of the quantity $k_e q_1 q_2$ is (a) Nm^2 (b) $Nm^{-2}C^2$ (c) $Nm^{-2}C^{-2}$
4. If you have two plates capacitor with charge Q and hollow sphere with charge Q distributed on the surface, then the electric field will be similar at: (a) Outside both of them (b) Inside the capacitor and outside the sphere (c)Outside the capacitor and inside the sphere

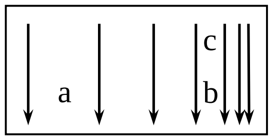

Fig. 2

5. Figure 2 shows the electric field lines. So, the electric flux: (a) increases as we go from "a" to "b" (b) increases as we go from "c" to "b" (c) is the same at "a", "b" and "c".
6. If the electric field E = 0 at a point P then , the electric flux must Φ_E be: (a)constant at P (b) zero at P (c) very high at P

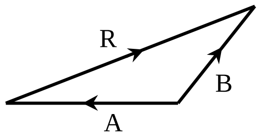

Fig. 3

7. From Fig. 3, the value of the resultant vector is (a) $R = A + B$ (b) $R = A - B$ (c) $R = B - A$
8. Object A has a charge of $2\mu C$, and object B has a charge of $8\mu C$. Which statement is true? (a) $\vec{F}_{AB} = -4\vec{F}_{BA}$ (b) $\vec{F}_{AB} = -\vec{F}_{BA}$ (c) $4\vec{F}_{AB} = -\vec{F}_{BA}$
9. The units of the electric field E is (a) NC^{-2} (b) NC^2 (c) NC^{-1}
10. Five positive charges (5q) are arranged symmetrically around the circumference of a circle of radius r. The electric field at the center of the circle is: (a) 0 (b) kq/r^2 (c) $5kq/r^2$

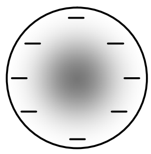
Fig. 4

11. Material of sphere in Fig. 4 is (a) insulator (b) conductor (c) semiconductor
12. The units of the Coulomb's constant k_e are (a) NC^{-2} (b) Nm^2C^{-2} (c) NC^{-1}
13. The electric field, E , is given by: (a) kq_1q_2/r (b) kq/r (c) F/q
14. The magnitude of the electric force F between charges q_1 and q_2 separated by distance r is given by: (a) $Fr = k_e q_1 q_2$ (b) $Fr^2 = k_e q_1 q_2$ (c) $F = k_e q_1 q_2 r^2$

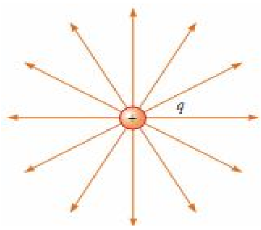

Fig. 5

15. The electric field lines in Fig 5 satisfy the relation: (a) $\underline{\nabla} \cdot \underline{E} = \rho$ (b) $\underline{\nabla} \cdot \underline{E} = \rho/\varepsilon_o$ (c) $\underline{\nabla} \cdot \underline{E} = 0$
16. The units of the electric flux Φ_E are (a) NmC^{-1} (b) Nm^2C^{-1} (c) NC^{-1}
17. Which of the following is incorrect: (a) $\underline{\nabla} \cdot \underline{E} = \rho/\varepsilon_o$ (b) $\underline{\nabla} \cdot \underline{D} = \rho$ (c) $\underline{\nabla} \cdot \underline{D} = \rho/\varepsilon_o$
18. According to Gauss's law, the total flux Φ_E out of any closed surface is: (a)Q/ε_o (b) $Q\varepsilon_o$ (c) ε_o/Q

19. Figure 6 shows a conducting sphere of radius R with charge Q. Then, the electric field at point "a" is (a) zero (b) $k_e Q/r^2$ (c) $k_e Q/R^2$

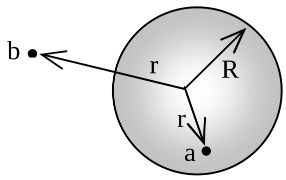

Fig. 6

20. Also from Fig. 6 the electric field at point "b" is (a) zero (b) $k_e Q/r^2$ (c) $k_e Q/R^2$

21. The charge density ρ of $\underline{D} = xy^2\hat{i} + yx^2\hat{j} + z\hat{k}$ is: (a) $x + y + 1$ (b) $y^2 + x^2 + 1$ (c) $y^2 + x^2 + \hat{k}$

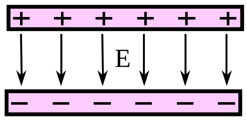

Fig. 7

22. The electric field lines in Fig. 7 satisfy the relation: (a) $\underline{\nabla} \cdot \underline{E} = \rho$ (b) $\underline{\nabla} \cdot \underline{E} = \rho/\varepsilon_o$ (c) $\underline{\nabla} \cdot \underline{E} = 0$

23. The electric field in the region between pair of oppositely charged parallel plates is 100 N/C. If $\varepsilon_o = 8.8 \times 10^{-12}$, then the surface charge density on each plate is: (a) zero (b) 17.6×10^{-12} (c) 8.8×10^{-10}

24. The differential form of Gauss law is: (a) $\underline{\nabla} \cdot \underline{D} = \rho$ (b) $\underline{\nabla} \times \underline{D} = \rho$ (c) $\underline{\nabla} \cdot \underline{D} = \sigma$

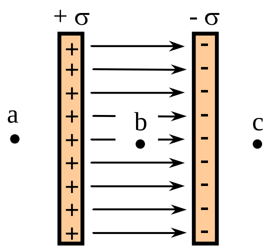

Fig. 8

- **With the help of Fig. 8:**

25. The electric field at point "a" is (a) zero (b) σ/ε_o (c) $2\sigma/\varepsilon_o$

26. The electric field at point "b" is (a) zero (b) σ/ε_o (c) $2\sigma/\varepsilon_o$

27. The electric field at point "c" is (a) zero (b) σ/ε_o (c) $2\sigma/\varepsilon_o$

28. The electric field "E" of an infinite thin sheet charged with uniform surface charge density σ is: (a) $\sigma/4\varepsilon_o$ (b) $\sigma/2\varepsilon_o$ (c) σ/ε_o

29. The radial component of the operator $\underline{\nabla}$ in cylindrical coordinates is: (a) $\partial/\partial r$ (b) $\partial/r\partial\theta$ (c) $\partial/\partial z$

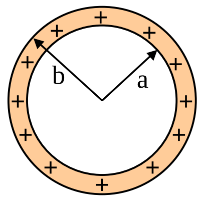

Fig. 9

- **A spherical conducting shell of inner radius "a" and outer radius "b" carries a total charge "$+Q$" distributed on its surface (Fig. 9).**

30. The electric flux at $r = a$ is (a) 0 (b) Q (c) Q/ε_o

31. The electric flux at $r = b$ is (a) 0 (b) Q (c) Q/ε_o

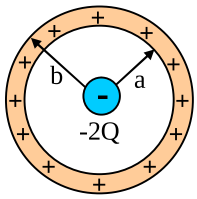

Fig. 10

- **If an additional charge of $-2Q$ is placed at the center (Fig. 10).**

32. The electric flux at $r = a$ is (a) 0 (b) $-Q/\varepsilon_o$ (c) $-2Q/\varepsilon_o$

33. The electric flux at $r = b$ is (a) 0 (b) $-Q/\varepsilon_o$ (c) $-2Q/\varepsilon_o$

34. The radial component of $\underline{\nabla} \cdot \underline{D}$ is: (a) $\partial/\partial r(rD_r)$ (b) $r^{-1}\partial/\partial r(rD_r)$ (c) $\partial/\partial z(rD_z)$

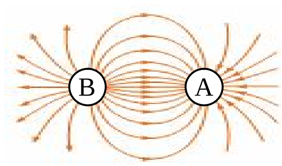

Fig. 11

35. The charge "A" in Fig. 11 is (a) positive (b) negative (c) no answer

36. The charge "B" in Fig. 11 is (a) positive (b) negative (c) no answer

37. The volume charge density ρ of the field $\underline{D} = \hat{r}$ is: (a) $1/r$ (b) $r^{-1}\partial/\partial r(rD_r)$ (c) $\partial r(rD_r)$

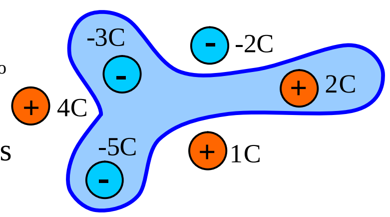

Fig. 12

38. The electric flux through the surface in Fig. 12 is: (a) $-3/\varepsilon_o$ (b) $3/\varepsilon_o$ (c) $-6/\varepsilon_o$

39. The z-component of $\underline{\nabla} \cdot \underline{D}$ in Cartesian and cylindrical coordinates are: (a) the same (b) different (c) no answer

- **Figure 13 shows a charged particle "q" moving in a magnetic field "B". The magnetic force F_B is always directed toward the center of the circle and a centripetal force F_c is upward the center. Then,**

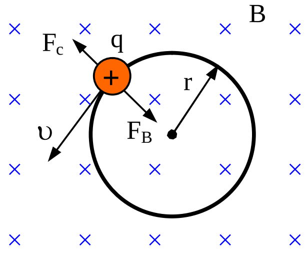

Fig. 13

40. The angular velocity "ω" is (a) r/υ (b) υ/r (c) υr
41. The magnetic force F_B is (a) $q\upsilon B$ (b) $m\upsilon^2/r$ (c) qBr
42. The centripetal force F_c is (a) $q\upsilon B$ (b) $m\upsilon^2/r$ (c) qBr
43. The radius of the path "r" is (a) $m\upsilon/qB$ (b) qB/m (c) qBr/m
44. The velocity of the particle "υ" is (a) $m\upsilon/qB$ (b) qB/m (c) qBr/m
45. Chose the correct equation (a) $mr = q\upsilon B$ (b) $mB = qBr$ (c) $m\upsilon = qBr$
46. The angular velocity of the particle "ω" is (a) $m\upsilon/qB$ (b) qB/m (c) qBr/m
47. The periodic time "T" can be calculated from (a) qBr/υ (b) $qB\upsilon/2\pi r$ (c) $2\pi m/qB$

- **Proton of charge** $q = 1.6\times10^{-19}\,C$ **and mass** $m = 1.67\times10^{-27}\,Kg$ **move in a circular orbit with radius** $2\,cm$ **under the effect of a magnetic field intensity** $0.2\,T$**. Then**

48. The proton velocity in its orbit is (a) $8.83\times10^6\,m/s$ (b) $3.83\times10^5\,m/s$ (c) $33.8\times10^4\,m/s$
49. The proton angular frequency is (a) $2.92\times10^3\,s^{-1}$ (b) $9.2\times10^5\,s^{-1}$ (c) $1.92\times10^7\,s^{-1}$
50. The time required for one complete revolution is (a) $0.237\times10^{-6}\,s$ (b) $0.237\times10^{-5}\,s$ (c) $0.27\times10^{-8}\,s$

GOOD LUCK,

Prof. Dr. Salah Hamza