Faculty of Computers & Artificial Intelligence — **Benha University**

1st Term (January 2021) Final Exam — **Date: 20/ 3 /2021**
Information Security and Digital Forensics Program — **Time: 2 Hours**
Networking and Mobile Technologies Program — **Total Marks: 50 Marks**
Course Code: FBS121, NBS121 **Level:** 1st level — **Examiner(s): Prof. Dr. Salah Hamza**
Subject: Physics

Choose the correct answer and shaded its circle (like this ●) in the answer table.

1. Coulomb's law is given by: (a) $Fr^2 = k_e q_1 q_2$; (b) $F = k_e q r^{-1}$; (c) $F = k_e q r^2$
2. Coulomb constant k_e is measured in (a) $Nm^{-2}C^{-2}$ (b) $Nm^{-2}C^{2}$ (c) $Nm^{2}C^{-2}$
3. Object A has a charge of $2\mu C$, and object B has a charge of $6\mu C$. Which statement is true? (a) $\vec{F}_{AB} = -3\vec{F}_{BA}$ (b) $\vec{F}_{AB} = -\vec{F}_{BA}$ (c) $3\vec{F}_{AB} = -\vec{F}_{BA}$
4. For A and B in Fig.1 which statement is true? (a) $\vec{F}_{AB} = -\vec{F}_{BA}$ (b) $\vec{F}_{BA} = -3\vec{F}_{AB}$ (c) a and b

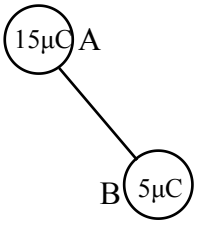

Fig.1

5. The electron and proton of a hydrogen atom are separated by a distance of about $5.3\times10^{-11}\,m$. The magnitudes of the electric force that each particle exerts on the other is (a) $2.8\times10^{8}\,N$ (b) $2.8\times10^{-8}\,N$ (c) $8.2\times10^{-8}\,N$ (taking $k_e = 9\times10^{9}$)
6. In Fig. 2 the electric field lines are (a) converge (b) unsymmetrical distributed (c) a and b
7. The units of the electric field E is (a) NC^{-2} (b) NC^{2} (c) NC^{-1}

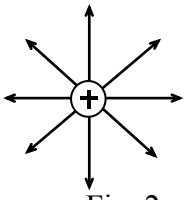

Fig. 2

8. The units of F/k_e is given by (a) C^2m^{-2} (b) m^2C^{-2} (c) $Nm^{-2}C^{-2}$
9. The units of the electric flux Φ are (a) NmC^{-1} (b) Nm^2C^{-1} (c) NC^{-1}
10. In Fig. 3, $E = 5\,NC^{-1}$ and $A = 4\,m^2$ then the electric flux Φ through xy plane is (a) $\frac{5}{4}Nm^2C^{-1}$ (b) $\Phi = 40\,Nm^2C^{-1}$ (c) $\Phi = 0\,Nm^2C^{-1}$

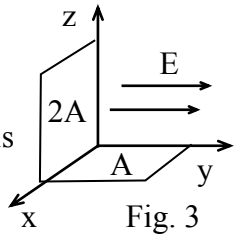

Fig. 3

11. In Fig.3, the electric flux through xz plane is (a) $\frac{5}{8}Nm^2C^{-1}$ (b) $40\,Nm^2C^{-1}$ (c) $0\,Nm^2C^{-1}$

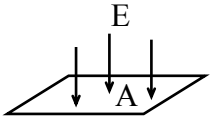

Fig. 4

12. In Fig.4 the flux of E through A is (a) $0\,Nm^2C^{-1}$ (b) $EA\,Nm^2C^{-1}$ (c) $E/A\,Nm^2C^{-1}$
13. Charges on conducting sphere are distributed at (a) center (b) outer surface (c) randomly
14. Fig. 5 shows a point charge q surrounded by a spherical surface of radius r, the electric flux Φ is given by: (a) E/ε_o (b) $4\pi q/r^2$ (c) $4\pi k_e q$
15. The electrical work done on moving charge q distance Δx is (a) $q\Delta x$ (b) $E\Delta x$ (c) $qE\Delta x$
16. For parallel-plate capacitor filled with dielectric, C, is (a) $\varepsilon_o A/d$ (b) $k\varepsilon_o A/d$ (c) kA/d

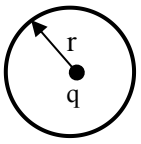

Fig. 5

17. Object A has a charge of $2\mu C$, and object B has a charge of $-6\mu C$. Which statement is true? (a) $\vec{F}_{AB} = \vec{F}_{BA}$ (b) $\vec{F}_{AB} = -\vec{F}_{BA}$ (c) $3\vec{F}_{AB} = -\vec{F}_{BA}$
18. The flux of a constant electric field of $3\,NC^{-1}$ in the z-direction through a rectangle with area $6\,m^2$ in the xz-plane. (a) $0\,Nm^2C^{-1}$ (b) $2\,Nm^2C^{-1}$ (c) $18\,Nm^2C^{-1}$
19. The unit "Farad" is equivalent to: (a) VC (b) V/C (c) C/V
20. The unit "Volt" is equivalent to: (a) J/C (b) C/J (c) JC
21. Figure 6 shows a conducting sphere of radius R with charge Q. Then, the electric field at point a and b are: (a) zero, k_eQ/r^2 (b) k_eQ/r^2, zero (c) zero, zero

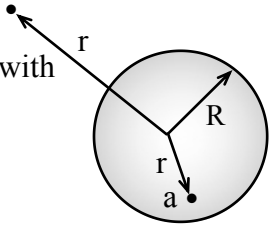

Fig. 6

- **Figure 7 shows a charged particle "q" moving in a magnetic field "B".Then,**

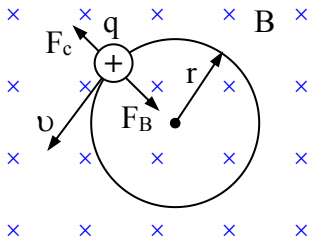

Fig. 7

22. The angular velocity "ω" is (a) r/υ (b) υ/r (c) υr
23. The magnetic force F_B is (a) $q\upsilon B$ (b) $m\upsilon^2/r$ (c) qBr
24. The centripetal force F_c is (a) $q\upsilon B$ (b) $m\upsilon^2/r$ (c) qBr
25. The radius of the path "r" is (a) $m\upsilon/qB$ (b) qB/m (c) qBr/m
26. The velocity of the particle "υ" is (a) $m\upsilon/qB$ (b) qB/m (c) qBr/m
27. Chose the correct equation (a) $mr = q\upsilon B$ (b) $mB = qBr$ (c) $m\upsilon = qBr$
28. The angular velocity of the particle "ω" is (a) $m\upsilon/qB$ (b) qB/m (c) qBr/m
29. The periodic time "T" can be calculated from (a) qBr/υ (b) $qB\upsilon/2\pi r$ (c) $2\pi m/qB$
30. The mass of the particle "m" can be calculated from (a) qBr/υ (b) $qB\upsilon/2\pi r$ (c) $B\upsilon r/q$

- **For the two charges in Fig. 8 the electric field due to:**

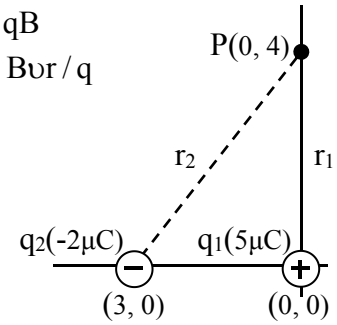

Fig.8

31. q_1 at P is (a) -0.36×10^4 V (b) 0.76×10^4 V (c) 1.12×10^4 V
32. q_2 at P is (a) -0.36×10^4 V (b) 0.76×10^4 V (c) 1.12×10^4 V
33. q_1 and q_2 (total) at P is (a) -0.36×10^4 V (b) 0.76×10^4 V (c) 1.12×10^4 V
34. The capacitance of parallel-plate capacitor is (a) Ad/ε_o, (b) $\varepsilon_o d/A$ (c) $\varepsilon_o A/d$
35. In ……., electric charges move freely (a) conductors (b) insulator (c) rubber
36. Charging by ….. requires no contact with objects (a)conduction (b)induction (c)reduction
37. The change in electric potential energy of charge q moving a distance Δx in an electric field is given by: (a) $-qE\Delta x$ (b) $E\Delta x$ (c) $-q\Delta x$
38. The force F on a particle with charge q is: (a) E/q (b) q/E (c) qE
39. In Fig. 9 the equivalent capacitance is (a) 14 μF (b) 3.12 μF (c) 20 μF
40. The capacitance C of a capacitor is measured in (a) Farad, (b) V/C (c) a and b
41. From Gauss law, the electric flux Φ is given by (a) $q_{in}\varepsilon_o$ (b) q_{in}/ε_o (c) ε_o/q_{in}
42. The material of the sphere in the Fig. 10 is (a) insulator, (b) conductor (c) semiconductor

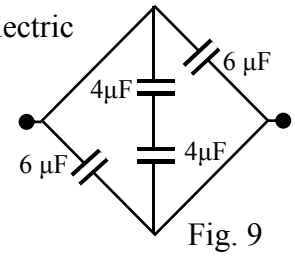

Fig. 9

- **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 2 T. Then**

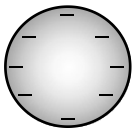
Fig. 10

43. The proton angular frequency is (a) $2.92\times10^3 s^{-1}$ (b) $9.2\times10^5 s^{-1}$ (c) $1.92\times10^7 s^{-1}$
44. The proton velocity in its orbit is (a) 8.83×10^6 m/s (b) 3.83×10^5 m/s (c) 33.8×10^4 m/s
45. Time required for one evolution is (a) 0.237×10^{-6} s (b) 0.237×10^{-5} s (c) 0.27×10^{-8} s
46. In Fig.11 the flux of E through A is (a) $0\ Nm^2C^{-1}$ (b) $EA\ Nm^2C^{-1}$ (c) $E/A\ Nm^2C^{-1}$
47. The units of Fr^2/k_e is given by (a) C^2m^{-2} (b) m^2C^{-2} (c) C^2
48. The flux of a constant electric field of $20\ NC^{-1}$ in the z-direction through a rectangle with area $10\ m^2$ in the yz-plane. (a) $0\ Nm^2C^{-1}$ (b) $200\ Nm^2C^{-1}$ (c) $2\ Nm^2C^{-1}$
49. The electric potential created by a point charge is measured in …….. and given by ……. (a) Volt, k_eq^2/r^2 (b) Volt, k_eq/r^2 (c) J/C, k_eq/r
50. The capacitance for parallel-plate capacitor is given by (a) $\varepsilon_o A/d$ (b) $k\varepsilon_o A/d$ (c) kA/d

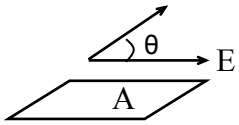

Fig.11

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Prof. Dr. Salah Hamza