Kafr Elshiekh University
Faculty of Engineering
Department of
Physical and Mathematical Engineering
Preparatory Year

22 January 2017
3 hours
90 Marks
Final exam

Engineering physics (1)

$q_e=1.6*10^{-19}C$	$K_e=8.9*10^9 Nm^2/C^2$	1mile =1.609km	$g=9.8m/s^2$

Question(1) : ***(15 Marks)***

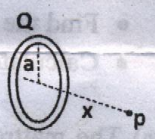
(a) Two electrons are separated by a distance of ($6*10^{-11}m$). Find the electric force exerted by one electron on the other.

(b) What is the meaning of "*Equipotential surface*"?

(c) The potential difference between two parallel sheets distance (*1.5cm*) apart is (*2500V*). Calculate the electric field between the sheets.

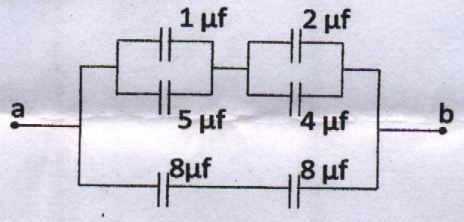
Question(2) : ***(30 Marks)***

(a) A uniform charged ring of radius (a) has a total charge of (Q). Derive the equation of the electric field at a point (P) as shown in figure.



(b) Consider a thin spherical shell of radius (14cm) with a total charge (32μC) distributed uniformly on its surface. Find the electric field at (10cm) and (20cm) from the center of the charged shell.

(c) Find the equivalent capacitance between a and b for the combination of capacitors shown in figure.



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Question(3) : ***(15 Marks)***

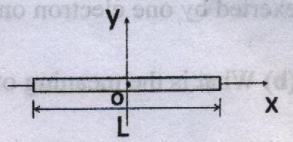
(a) A car is traveling at a speed of (*32m/s*). Is the driver exceeding the speed limit of (*75 mile/h*)?

(b) What are the different types of "*Elastic Modulus*" of solids?

(c) What is the centripetal acceleration of the Earth as it moves in its orbit around the sun? (*radius of orbit (r)= 1.496*10^{11}m*).

Question(4) : ***(30 Marks)***

(a) Calculate the moment of inertia of a uniform rigid rod of length (*L*) and mass (*M*) about an axis perpendicular to the rod and passing through its center of mass as shown in figure.



(b) A (*200g*) block connected to a light spring for which the force constant (*5N/m*) is free to oscillate on a horizontal frictionless surface. The block is displaced (*5cm*) from equilibrium and released from rest:

- Find the period of its motion, maximum speed and maximum acceleration.
- Calculate the total energy of the system.

(c) The mattress of a water bed is (*2m*) long by (*2m*) wide and (*25cm*) deep. It supported by four legs, each leg has a circular cross section of radius (*2cm*): (ρ=1000kg/m^3)

- Find the weight of the water in the mattress
- What pressure does this bed exert on the floor?

Best Wishes **Dr. Demyana Adel Abdel Masieh**