Physics 172
Spring Quarter 1981
April 17, 1981

1ST MIDTERM

1 8.9
2 4.4
3 12
4 15.9
41.2

– Key –

Name: _____ B Average →

Discussion Instructor: Battelino Bruno (DeSisto) Gehrke Izatt
Roshko Sawyer Shastry

scores 153
Average 8.92
st. dev. 3.98

PROBLEM 1B

1. (a) Find the value of g 3000 miles above the moon's surface (ignore the earth.) 6.4×10^{-2} m/sec²

2. (b) Find the angular momentum of the earth rotating on its axis. 7.0×10^{33} kg-m²/sec

3. (c) Find the force between an electron and a proton 0.5×10^{10} m apart. -9.2×10^{-47} N

(–) sign signifies attractive force.

4. (d) Find the value of g 500 miles from the center of the moon. 0.75 m/sec²

5. (e) Find the electric field 20.0 m away from a metal sphere which has a charge of 3.0×10^{9}C. 6.8×10^{16} N/C

$g_{surface} = \frac{Gm}{r^2}$ $\quad g_{inside} = \frac{Gm}{r^2}$

$g(3000) = \frac{g_{surface} r_m^2}{r^2} = \frac{1.5\ (1000)^2}{(3000+1000)^2}$

$= \frac{1.5 \times 10^6}{16 \times 10^6} = 0.094$

$\vec{L} = I\vec{\omega}$

$= \frac{2}{5}(6\times10^{24})\left[(4000)(5280)(0.3)\right]^2 \cdot \frac{2\pi}{24(60)(60)}$

$= 7.0 \times 10^{33}$ $\frac{kg\text{-}m^2}{sec.} = N\text{-}m\text{-}sec$

$F = \frac{1}{4\pi\epsilon_0} \cdot \frac{q_1 q_2}{r^2} = \frac{-9\times10^9\ (1.6\times10^{-19})^2}{(0.5\times10^{10})^2} = -9.2 \times 10^{-47}$ N

4. $g = \frac{Gm}{r^2} = \frac{G \frac{4}{3}\pi r^3 \rho}{r^2}$

$= \frac{4}{3}\pi G r \rho = \frac{g_{surface}}{R} r$

$\rho = \frac{M}{V} = \frac{3 g_{surface} R^2}{4\pi G R^3}$ $\quad \frac{1.5(500)}{1000} = 0.75$

5. $E = \frac{1}{4\pi\epsilon_0} \frac{q}{r^2}$

$= \frac{9\times10^9\ (3\times10^9)}{20^2}$

$E = 6.75 \times 10^{16}$ N/C