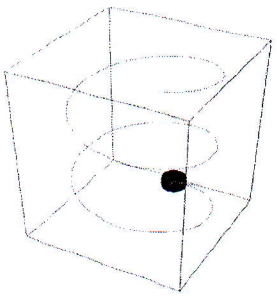
Post graduate Exam (Basic Engineering Sciences)
Branch: Engineering Mathematics (Ph.D.700)

Menuofia University **Faculty of Engineering, Shebin El-Kom** **Academic Year:2016-2017** **Department: Basic Eng. Sci.**		**Subject: Engineering Physics** **Code: BES 713** **Time Allowed: 3 hours** **Date: 3/6/2017** **Max Marks: 100**

Answer all the following questions:

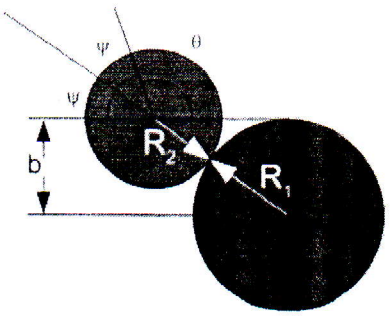
Question 1 (25 mark)



1. Discuss the main classification of the classical dynamics.
2. Describe the motion of a bead with constant orbital velocity confined to a helix
3. Describe The basic laws which used in modeling and description of motion simulations.

Question 2 (30 mark)

1. State the main fundamental forces in the nature and what is the different between strong nuclear force and weak nuclear force.
2. Consider the hard sphere scattered on each other, the geometry of scattering process is shown in the following figure; where $R_1 + R_2 = 1$, $\varphi = \frac{\pi}{2} - \frac{\theta}{2}$ and impact parameter is given by $b = \sin\varphi$, determine the total scattering cross section.



3. From the integral differential equation of weak nonlinear wave $u_t - uu_x + \int_{-\infty}^{\infty} K(x-\xi)\, u_\xi(\xi,t)\, d\xi = 0$, Drive the Korteweg–de Vries equation.

Question 3 (45 mark)

1. Discuss the structure of the phase space and explain the dynamic of it, then determine the dynamics of a nonlinear oscillating system with Heno chaotic map.
2. Define the chaotic dynamics system and Lyapunov exponent.
3. Estimate Lyapunov exponent for n dimensional autonomous and then estimate it for logistic map.
4. Explain different models (Maxwell–Garnett (MG) model, Bottcher mixture (BM) model and Power-law model) for computing the effective dielectric constant of nanocomposite.
5. Describe the effect of filler volume fraction, filler dielectric constant and particle shape and orientation on the effective dielectric constant for proposed model.

Good luck