Mansoura University | **Second term Exam, 15/5/2016**

Faculty of Science | **2nd level Physics**

Physics Department | **Time allowed : 2 hours**

Full mark : 80 marks

Subject : physics | **Course : 221ف Physical optics**

Answer the following questions:

1- a) With the aid of the defination of resolving power of an optical system, drive an expression for the resolving power of a prism has a length of the base equal t and a reflective index μ. (18 marks)

b) What should be the total number of lines, a grating must have in order to just separate the sodium doublet of wavelengths $\lambda_1 = 5896\ A^\circ$ and $\lambda_2 = 5890$ in the second order. (9 marks)

2- a) Explain the principle of change of phase at reflection. Discuss haw the presence of dark spot at the center in Newton's ring pattern, confirm this principle. (9 marks)

b) With the aid of necessary formulae, describe the interference fringes produced by Young's experiment. (9 marks)

c) white light illuminates a thin transparent material of thickness $2800A^\circ$ at the normal incidence. If the refractive index of this material is 1.34 , what colour (wavelength) will appears in the reflected light? (9 marks)

3- a) Derive an expression for the intensity distribution of the produced interference fringes when using Fabry-Perot interferometer in transmission. (18 marks)

b) How the angle between the polarizer and analyzer axes should be set to make the emergent light intensity from the analyzer equals a quarter of the emergent light intensity from the polarizer. (8 marks)

With my best wishes

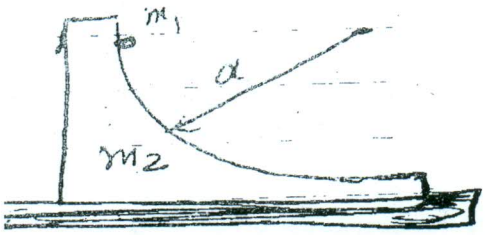
Prof. Dr. Taha Sokkar

Mansoura University
Faculty of Science
Physics Department

Second semester
8/6/2016

2nd level physics students
Full Mark: 80
Allowed time: 2 hours
Course title: Analytical Mechanics
Course code: Phys. 223

Answer the following questions: Marks

1-	A particle of mass (m_1) is slides down the smooth circular surface of radius of curvature (a) of a wedge of mass (m_2) that is free to move horizontally along the smooth horizontal surface on which is rests. (a) Find the equation of motion for each mass. (b) Find the normal force of constraint exerted by the wedge on the particle. Use the method of lagrange multipliers. 	15
2-	Prove that, for any three functions F, G and K of q's and P's, the following Jacobi's identity is true [F, [G, K]]+[G, [K, F]]+[K, [F, G]]=0.	10
3-	Derive the equation of velocity and the acceleration in the cylindrical coordinates.	10
4-	Derive the Hamiltons canonical equations.	15
5-	Prove that the transformation $P = \frac{1}{2}(p^2 + q^2)$, $Q = \tan^{-1}(\frac{q}{p})$ is canonical.	15
6-	Write briefly on the following: (i) The main difference between Newton, lagrange and Hamilton in solving mechanical system. (ii) The generalized coordinates and the generalized momentum. (iii) The conservative and nonconservative system. (iv) Cyclic coordinates.	15

Best wishes:

Examiner: Prof. Dr. Mohammed Tawfik Attia

Mansoura University
Faculty of Science
Physics Department.
Subject: Physics(3)
Title: Atomic physics.
Code : 222

Final term exam – 2nd term
2nd Year/BioPhys. &Phys.
Date: may. 2016
Allowed Time: 2 hours.
Full Mark: 80 Mark

Answer the following questions

[1] a- Verify that the normal "Zeeman effect" denotes the splitting of atomic energy levels due to the interaction of the electron orbital angular momentum with the external magnetic field ? [20] Mark

b- Determine the normal Zeeman splitting of the cadmium red line of 6438Å when the atoms are placed in a magnetic field of 0.009 T? [5] Mark

[2] a- What problem is there with the classical model of the $_1H^1$ atom in which an electron circulates around a nucleus? According to Bohr model, derive the expression of energy levels for hydrogen atom? [18] Mark

b- A photon is emitted as a hydrogen atom under- goes a transition from the n = 6 to the n = 2 state. Calculate (a) the wavelength, (b) the energy, and (c) the frequency of this photon. [6] Mark

c- Determine the shortest and longest wavelengths of Lyman series of hydrogen? [6]Mark

[3] a - Describe how each of the orbital angular momentum and spin angular momentum is quantized in space? [9] Mark

b- Write about:
i) splitting of D levels of sodium due to spin – orbit interaction ? [8]Mark
ii)Stern–Gerlach experiment ? [8] Mark

Const.: C =3x10^8 m/s, h = 6.283 x10^{-34} J.s, ε_0 = 8.85x 10^{-12} F/m, R= 1.097 x10^7 m^{-1}, m_e = 9.1x10^{-31}Kg, e= 1.6 x10^{-19} Col.,

Best wishes, : *Prof.Dr. Kermal El-farahaty*

University of Mansoura, Faculty of Science, Department of Physics, Subject: Physics.		Second Term, Second Year: Physics, Date: 18 May 2016, Time allowed: 2 hours.
Course (s): **Physics (220): Modern Physics.**		Full Mark:80 Mark.

Answer **the** following Questions

[1-a] Derive Galilean coordinate, velocity and the acceleration transformations. What is the limitation of Galilean transformation?

[1.b] Prove that the form of the conversation of linear momentum, kinetic energy and Newton's second law are invariant under Galilean transformation.

[2.a] State and Discuss Einstein's postulates of relativity.

[2.b] Derive Lorentz coordinate and velocity transformations.

[2.c] What are the consequences which may be drawn from the Lorentz velocity transformation?

[3] From a quantization view point, Discuss Blackbody radiation, Photoelectric effect, Compton effect

[4] Using Eisberg and Resnick method, derive Schrödinger wave equation.

With my best wishes
Prof. Dr. A. Elgarayhi

Examiners: 1- Prof. Dr. S. El-Wakil **2- Prof. Dr. A. Elgarayhi**