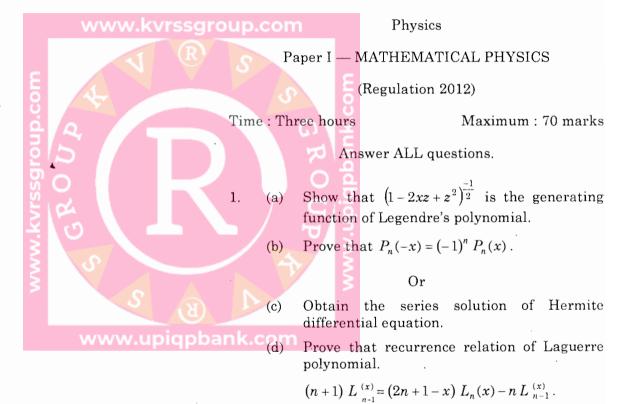
### (PHY10112)

# M.Sc. DEGREE EXAMINATION, OCTOBER/NOVEMBER 2018.

First Semester



- Explain the second shifting and change of 2. scale properties of Laplace transform.
  - that  $L\left\{\cos at\right\} = \frac{s}{s^2 + a^2}$ (b)
    - $L\left\{\sin at\right\} = \frac{a}{s^2 + a^2}.$

- Obtain the Laplace transform of a derivative. (c)
- Using Laplace transform of derivative find (d) the Laplace transform of 't cost t'.
- Obtain the Fourier coefficients of a Fourier 3. (a) series.
  - the function f(x) = |x|(b) Expand  $-\pi \le x \le \pi$  in Fourier series

Or

(c) Define Fourier Transform and find the Fourier transform of  $f(x) = \begin{cases} 1, & |x| \le a \\ 0, & |x| > a \end{cases}$ .

2

Explain Fourier Transform of delta function. (d)

- State and explain Cauchy's integral theorem. 4.
  - Expand  $f(z) = \ln(1+2)$  in a Taylor series about z = 0

Or

- Explain the calculus of Residues. (c)
- www.kvrssgroup.c Show that  $\int_{a}^{\infty} \frac{dx}{x^4 + a^4} = \frac{\pi \sqrt{2}}{4 a^3}, \quad a > 0 \quad \text{using}$ contour integrals.
  - 5. Explain the transformation of coordinates. (a)
    - (b) Discuss the addition and multiplication of tensors.

Or

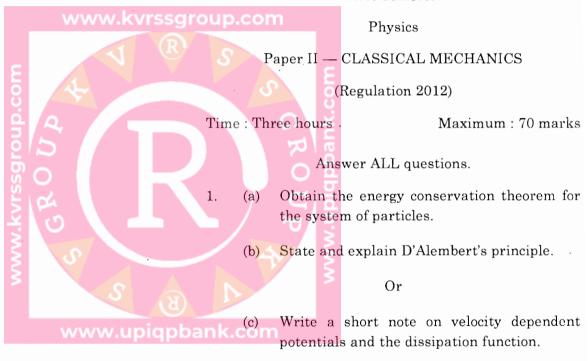
- Explain quotient law of tensor. (c)
- Write a note on fundamental tensors. (d)

3

## (PHY10212)

# M.Sc. DEGREE EXAMINATION, OCTOBER/NOVEMBER 2018.

First Semester



(d) Write down the simple applications of Lagrangian formulation.

- 2. (a) What are generalized coordinates? Explain the advantages of using them.
  - (b) Classify orbits and obtain the differential equation for the orbit.

- (c) Explain the motion of particle under inverse square force on the case of a Keplers problem.
- (d) Discuss briefly the scattering in a central force field.
- 3. (a) State Hamilton's principle and deduce the Hamilton's equations from modified Hamilton's principle.
  - (b) State and explain principle of least action.

Or

- (c) Prove that the transformation defined by  $P = \frac{1}{2}(q^2 + p^2) \text{ and } \tan Q = \frac{q}{p} \text{ is canonical.}$
- (d) Obtain the angular momentum Poisson bracket relations.

- 4. (a) Discuss Hamilton-Jacobi equation for Hamilton's characteristic function.
  - (b) Explain the action angle variables in systems of one degree of freedom.

Or

- c) Define normal coordinate and obtain an expression for kinetic energy in normal coordinates.
- (d) Explain the vibrations of linear triatomic molecule.
- (a) Explain what do you understand by the independent coordinates of a rigid body.

5.

(b) Discuss the concept of moment of inertia and inertia tensor.

Or

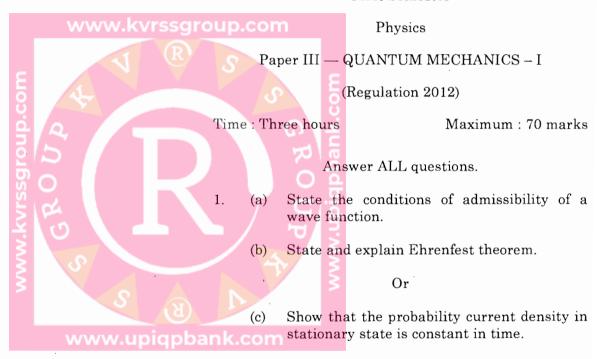
3

- (c) Solve the Euler's equations of motion for a torque free motion of a rigid body.
- (d) State and explain coriolis effect.

## (PHY10312)

# M.Sc. DEGREE EXAMINATION, OCTOBER/NOVEMBER 2018.

#### First Semester



(d) Explain the transmission of a particle through a potential barrier quantum mechanically.

- 2. Write about linear vector space in quantum mechanics and change of basis.
  - Show that the eigen values of Hermitian operator an real.

5. Describe the salient features (a) of time dependent perturbation theory.

Or

Explain Fermi's golden rule for constant transition rates.

Or

Explain the interaction of an atom with the (c) Write a note on projection and positive electromagnetic radiation. operators.

- Explain the orthogonalization procedure.
- Obtain the commutation relations for 3. angular momentum operator.
  - Obtain the eigen values and eigen vectors of  $L^2$  and  $L_z$  operators.

Or

- Show that  $[L_z, L_+] = \hbar L_+$  and  $[L^2, L_-] = 0$ .
- Obtain the eigen values of a rigid rotator.
- 4. Explain time-independent perturbation (a) theory for non-degenerate system.
  - Explain stark effect in hydrogen atom.

Or

2

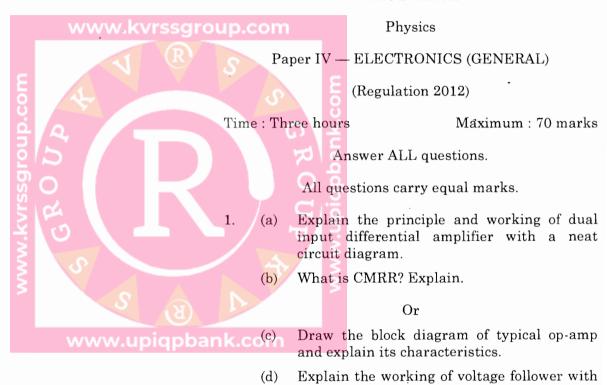
- Explain variation method.
- Using variation method find the energy lends of the ground state of Helium atom.

adiabatic Discuss sudden and (d) approximation.

## (PHY10412)

# M.Sc. DEGREE EXAMINATION, OCTOBER/NOVEMBER 2018.

First Semester



a neat circuit diagram.

- 2. (a) Explain the important terms input offset voltage, input offset current and CMRR frequency response in op-amp.
  - (b) Explain the concepts of feedback and frequency stability in oscillators.

- (c) Draw the circuit diagram of mono stable multivibrator and explain its working.
- (d) Explain the working of adjustable voltage regulator using op-amp.
- 3. (a) Explain the generation and demodulation of AM waves.
  - (b) Discuss the coherent detection of DSBSC waves.

Or

- (c) Define SSB modulation and explain the detection of SSB waves.
- (d) Write a note on Frequency Division Multiflexing (FDM).
- 4. (a) Explain the working of encoder with a neat circuit diagram.
  - (b) Explain the working of multiplexer as a data selection.

Or

2 (PHY10412)

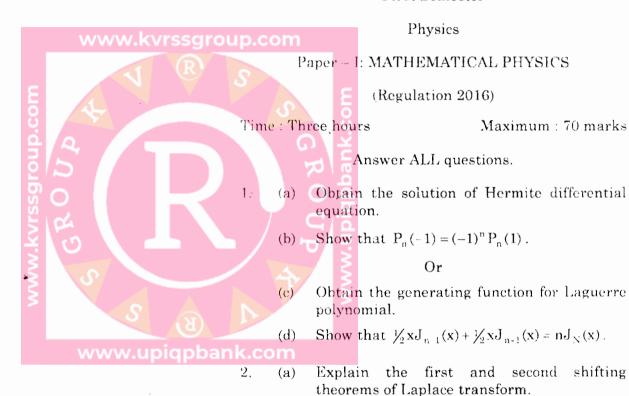
- (c) Write a neat circuit diagram explain the operation of T flip-flop and D flip-flops.
- (d) Explain the working of cascade counter with a neat diagram.
- 5. (a) Explain the addressing modes of 8085.
  - (b) Explain the pin configuration of 8085.

- (c) Write an ALP to add 8-bit numbers.
- (d) Describe the architecture of 8051 micro controller.

### (PHY10116)

#### M.Sc. DEGREE EXAMINATION, NOVEMBER 2018

#### First Semester



(b) Find the Laplace transform of ear cosbt'.

- (c) Briefly explain the partial fraction method for finding the Inverse Laplace transform.
- (d) Explain the convolution theorem.
- 3. (a) Explain the half wave expansions in Fourier series.
  - (b) Find the Fourier integral of the  $f(x) = e^{-kt}$  when x>0.

- (c) Explain the Parseval's and Modulation theorems in Fourier Transforms.
- (d) Find the Fourier sine transform of  $t^2$  in the range  $0 \le t \le \pi$ .
- 1. (a) State and prove Cauchy's integral theorem.
  - (b) Evaluate the integral  $\int_{C} \frac{zdx}{(9-z^2)(z+i)'}$  where c is the circle |z| = 2described in the positive sense.

Or

- (c) State and prove Taylor's expansion.
- (d) Obtain the Laurent's series expansion of  $f(z) = \frac{1}{z^2 3z + 2}$  in the region 1 < |z| < 2

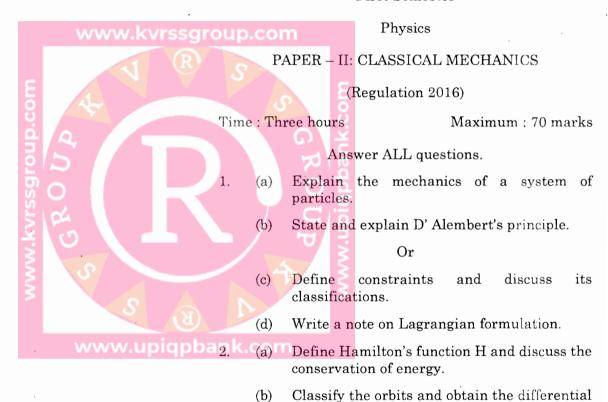
- 5. (a) Explain the transformation of coordinates in tensors.
  - (b) If  $A^i$  and  $B_j$  are the components of a contravariant and covariant tensor of rank one, the  $C^ij = A^iB_j$  are components of a mixed tensor of rank two.

- (c) Write a note on fundamental tensors.
- (d) Show that contraction of a tensor of rank leads to a scalar.

## (PHY10216)

M.Sc. DEGREE EXAMINATION, NOVEMBER 2018.

#### First Semester



Or

equation for the orbit.

- (c) Explain the integral power law potentials and obtain the condition for closed orbits.

5.

a) Define inertia tensor and explain the principal moments of inertia.

(d) Discuss the scattering in a central force field.

(b) Explain the infinitesimal rotations.

3. (a) State and explain Hamilton's principle.

Or

(b) Obtain the Lagrange's equations from WISSGIOUP (c) Explain the motion of a rigid body. variational principle.

(d) Explain the torque free motion of rigid body.

3

Or

- (c) Obtain canonical transformations from Legendre transformations.
- (d) Show that the transformations  $Q = 1/p, P = qp^2$  are canonical.
- 4. (a) Obtain the Hamilton-Jacobi equation from Hamilton's principal function.
  - (b) Write a note on action angle variables.

- (c) Explain the two coupled oscillations.
- (d) Discuss the vibrations of linear triatomic molecule.

### (PHY10316)

#### M.Sc. DEGREE EXAMINATION, NOVEMBER- 2018.

First Semester

**Physics** 

Paper - III: QUANTUM MECHANICS-I

(Regulation 2016)

Time: Three hours

Maximum: 70 marks

Answer ALL questions.

- 1. (a) Explain the inadequacy of classical mechanics
  - (b) State and explain Ehrenfest theorem

Or

- (c) Write a note on stationary states
- (d) Obtain Schrodinger equation in the harmonic oscillator problem
- 2. (a) Discuss the linear vector spaces in quantum mechanics.
  - (b) What do you mean by change of basis? Explain

Or

- (c) Write a note on unitary and positive operators
- (d) Explain about the orthogonalization procedure

- 3. (a) Obtain the commutation relations for angular momentum operator
  - (b) Obtain the angular momentum in spherical polar coordinate

Or

- (c) Obtain Eigen values for L2 and L2 operators
- (d) Obtain the Eigen values of rigid rotator
- (a) Discuss the time-independent perturbation theory for degenerate systems
- (b) Write short note on WKB method and its applications.

Or

(c) Discuss variation method

4.

5.

- (d) Using the variation method obtain the ground state of Helium atom.
- (a) Briefly explain the time dependent perturbation theory.
- (b) Obtain Fermi's Golden rule

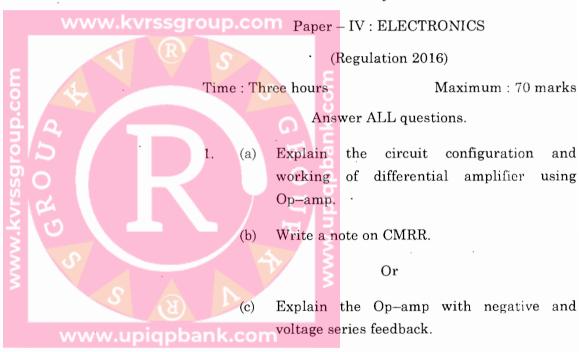
- (c) Explain the interaction of an atom with the electromagnetic radiation
- d) Write a note on sudden and adiabatic approximation.

## (PHY10416)

#### M.Sc. DEGREE EXAMINATION, NOVEMBER 2018.

First Semester

**Physics** 



(d) Explain the effect of feedback on input resistance and output resistances.

- 2. (a) Explain how op-amp can work as an summing and scaling amplifier.
  - (b) Explain the working of LC tunable oscillator.

- (c) Obtain the frequency stability criteria in oscillators.
- (d) With a neat circuit diagram explain the operation of Wein bridge oscillator.
- 3. (a) Explain the demodulation of AM waves.
  - (b) Define DSBSC modulation and explain the generation of DSBSC waves.

Or

- (c) Explain the detection of SSB waves.
- (d) Write a note on vestigial side band modulation.
- 4. (a) With a circuit diagram explain the working a multiplexer.
  - (b) Explain how De Multiplexer works as a data distributor with a block diagram.

Or

- (c) Explain the working of R-S and JK flip-flops.
- (d) Write a note on asynchronous and synchronous counters.

5. (a) Describe the architecture of 8085.

(b) Explain the instruction set of 8085.

Or

- (c) Write an ALP to find the highest number in a series.
- (d) Write a note on stack and subroutine.

(PHY10416)

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