(DPHY 01)

M.Sc. (Previous) DEGREE EXAMINATION, DECEMBER – 2015

First Year

PHYSICS

Paper – I : Mathematical Physics

Time : 3 Hours **Maximum Marks: 70**

Answer any five questions

All questions carry equal marks

1) a) Write the Hermite's equation and find its solution.

b) Derive the generating function for the Hermite's polynomials.

2) a) Write the Legendre's differential equation and find its solution.

b) To prove the Legendre's recurrance relation $x\,P_l'(x) - P_{l-1}'(x) = l\,P_l(x)$

3) Find the necessary and sufficient condition for F(z) to be analytic.

4) a) State and prove Taylor theorem.

b) Evaluate the Integral $\int_0^{2\pi} \frac{d\theta}{5-3\cos\theta}$

5) a) What are the symmetric and antisymmetric tensors? Explain.

b) Discuss the algebraic operations on Cartesian tensors.

6) a) What are the special Cartesian tensors? Explain.

b) Discuss on associated tensors.

7) Find the Fourier transform of

$$f(x)=\begin{cases}1-x^2 & \text{if } |x|\le 1\\ 0 & \text{if } |x|>1\end{cases}$$

and use it to evaluate $\int_0^{\infty}\frac{x\cos x-\sin x}{x^3}\cos\left(\frac{x}{2}\right)dx$

8) a) State and prove first and second shifting theorems.

b) Find the Laplace transform of $\cos^2 t$.

9) Answer any Two of the following:

a) Derive the generating function for the Bessel functions.

b) Laurent's theorem.

c) Tensors in elasticity.

d) Find the Fourier transform of the function.

$$f(x)=\begin{cases}t, & \text{for } |t|<a\\ 0 & \text{for } |t|>a\end{cases}$$

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(DPHY 02)

M.Sc. (Previous) DEGREE EXAMINATION, DECEMBER – 2015

(First Year)

PHYSICS

Paper – II : Classical Mechanics and Statistical Mechanics

Time : 3 Hours **Maximum Marks: 70**

Answer any Five questions

All questions carry equal marks

1) a) State and explain D'Alembert's principle and princple of least action.

b) Derive the Lagrangian equation from Hamilton principle.

2) a) Write about angular momentum and kinetic energy of a rigid body.

b) Obtain Euler equations of motion to rigid body.

3) a) Obatin the Lagrangian formulations of relativistic mechanics.

b) Explain Lagrangian and Poisson brackets with examples.

4) a) Obtain Hamilton- Jacobi equations from Hamilton's principle.

b) Deduce the relations of action –angle variables.

5) a) State and explain the Boltzmann equipartition theorem.

b) Distinguish between microcanonical, canonical and gand canonical ensembles.

6) a) What is Gibb's paradox. How it can be resolved.

b) Discuss rotational partition function.

7) a) What is partition function. Obtain its value for an ideal mono atomic gas by using microcanonical ensemble.

8) a) Derive the distribution law for Maxwell –Boltzmann and Bose-Einstein statistics.

b) Write about Bose –Einstein condensation.

9) Write notes on any TWO of the following.

a) Principle of virtual work

b) Liouville's Theorem

c) Theory of small oscillation

d) Theory of white dwarfs.

(DPHY 03)

M.Sc.(Previous)DEGREE EXAMINATION, DECEMBER – 2015

(First Year)

PHYSICS

Paper – III : QUANTUM MECHANICS

Time : 3 Hours **Maximum Marks: 70**

Answer any Five questions

All questions carry equal marks

1) a) State and explain postulates of quantum mechanics.

b) Describe Dirac's bra and ket notations. State and explain Ehrenfest theorem.

2) a) Obtain the solution of wave equation in one dimension for a particle moving in a constant potential field with finite walls.

b) Obtain Eigen values and eigen functions for simple harmonic oscillator.

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3) a) Solve the problem of normal helium atom by time independent perturbation theory.

b) Write about general perturbation theory.

4) a) Distinguish between time independent perturbation theory and time dependent perturbation theory.

b) What are transition states. Write about Einstein transition probabilities.

5) a) Obtain eigen values and eigen functions to L^2 and L_z.

b) Discuss spin angular momentum and obtain Pauli spin matrices.

6) a) Obtain matrices for J_x, J_y and J_z.

b) Describe the theory of Clesbach Gordon coefficients in addition of angular momentum.

7) a) Obtain the equation of motion in Schrodinger's picture.

b) Discuss the correspondence between Schrodinger and Heisenberg picture with classical mechanics.

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8) Write a note on any TWO of the following.

a) Ortho normality of eigen functions.

b) Stark effect in hydrogen atom.

c) Probability and current density

d) Write about negative energy states and spin of electron

(DPHY 04)

M.Sc. (Previous) DEGREE EXAMINATION, DECEMBER – 2015

First Year

PHYSICS

Paper – IV : Electronics

Time : 3 Hours **Maximum Marks: 70**

Answer any five questions

All questions carry equal marks

1) a) What is an OP-Amp? Explain the working of a differential amplifier.

b) What is the principle of oscillator? Explain the working of Wien- bridge oscillator.

2) a) Explain the effect of negative feedback in an OP-Amp.

b) How an OP-Amp used as inverting and non-inverting amplifier.

3) a) What is mean by transit time effect? Explain the working of travelling wave tube.

b) What are the factors that effect the gain of travelling wave tube?

4) a) What is frequency modulation? Discuss the generation of FM waves.

b) Explain the principles of working of super heterodyne receiver.

5) a) What is decoder? Explain its working.

b) Discuss the working of JK master slave flip-flop.

6) a) What is an A/D conversion? Explain the operation of counter type A/D converter.

b) Explain the working of R-2R ladder D/A converter.

7) a) What are the addressing modes in 8085 microprocessor? Explain.

b) Where are symbols used in flow chart? Explain.

8) a) Classify the instruction set of 8085 μp. Explain them.

b) What is looping? Explain its purpose.

9) Write any two of the following:

a) Differential amplifier.

b) Klystron oscillator.

c) Multiplexer / Data selection.

d) 8085 μp Architecture.

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