(DPHY01)

Total No. of Questions : 09] **[Total No. of Pages : 2**

M.Sc. (Previous) DEGREE EXAMINATION, MAY – 2017

First Year

PHYSICS

Mathematical Physics

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

Answer any five questions

All questions carry equal marks

Q1) a) Obtain the series solution of Legendre's differential equation.

b) Show that $J'_n(x) = \frac{1}{2}\left[J_{n-1}(x) - J_{n+1} - (x)\right]$

Q2) a) Obtain the two fundamental recurrence relations of Hermite polynomial.

b) Show that $(n+1)L_{n+1}(x) = (2n+1-x)L_n(x) - nL_{n-1}(x)$

Q3) a) State and obtain Cauchy – Riemann equations.

b) Prove that $u = e^{-\lambda}(x\sin y - y\cos y)$ is harmonic and fine v such that $f(x) = u + iv$ is analytic

Q4) a) State and prove Cauchy's integral formula.

b) Find Taylor's series for the function $z^3 - 3z^2 + 4z - 2$ about z = 2

Q5) a) Mention different types of tensors.

b) Give the transformation laws of tensors of 3rd rank.

Q6) a) Prove that kronecker delta is a mixed tensor.

b) Explain quotient law of tensor.

Q7) a) Explain partial fraction method for Inverse Laplace Transform.

b) Find the Laplace Transform of

i) $t^2 + ab + b$

ii) $\sinh^2 2t$

Q8) a) Find the fourier series for $f(x)$ in the interval $(-\pi, \pi)$ where

$$f(x) = \pi + x, \ -\pi < x < 0$$
$$\pi - x, \ 0 < x < \pi$$

b) Find the Fourier transform of an integral.

Q9) Write any two of the following

a) Using Generating function show that

$$\sum_{m=0}^{\infty}(2m-1)P_m(x)=0 \text{ for } x\neq\pm1$$

b) Jordan's inequality.

c) Transformation law of christoffel symbols.

d) FT of Delta function.

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(DPHY02)

Total No. of Questions : 09] **[Total No. of Pages : 2**

M.Sc. (Previous) DEGREE EXAMINATION, MAY – 2017

First Year

Physics

Classical Mechanics and Statistical Mechanics

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

Answer any five questions

All questions carry equal marks.

Q1) a) Define D' Alembert's principle and obtain Lagranges equations of motion from it for conservative systems.

b) Obtain the solution for simple pendulum using Lagrange's equations.

Q2) a) Explain Eulerian angles with neat diagrams and obtain transformation matrix involving these angles.

b) Write notes on coroiclis force and effect.

Q3) a) Define canonical transformations and obtain transformation equations for F1 and F4 generating functions.

b) Define Lagrange and poisson brackets also Obtain the relation between Lagrange and Poisson brackets.

Q4) a) Obtain Hamilton – Jacobi equation.

b) Apply it to linear harmonic oscillator.

Q5) a) Define an ensemble. Find the probability of finding the system in any one particular state according to canonical ensemble.

b) Explain the energy fluctuations in the canonical ensemble.

Q6) a) Obtain the partition function 'Z' for ideal monatomic gas classically.

b) Using it determine the thermodynamic qualities of ideal gas

c) ***Q7)*** a) Mention the fundamental postulate of statistical mechanics with examples.

b) Explain Bose – Einstein condensation.

Q8) a) Obtain the equation of state of an ideal Fermi gas.

b) Write notes on white dwarf stars.

Q9) Write notes on Two of the following :

a) State and prove energy conservation theorem for a system of particles.

b) What is the physical significance of Hamiton's characteristic function.

c) Write notes on action angle variables.

d) Explain Gibb's paradox.

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(DPHY03)

Total No. of Questions : 08] **[Total No. of Pages : 1**

M.Sc. (Previous) DEGREE EXAMINATION, MAY – 2017

First Year

PHYSICS

Quantum Mechanics

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

Answer any Five questions

All questions carry equal marks

Q1) a) Explain the postulates of quantum mechanics.

b) Define well behaved wave functions and explain their properties.

Q2) a) Explain the orthogonalits of Eigen functions.

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

Q3) a) Obtain energy values to normal He atom by time independent perturbation theory.

b) Write about degenerate states.

Q4) a) Explain the WKB method of time dependent perturbation theory.

b) Write a note on sudden and adiabatic approximations.

Q5) a) Obtain the commutation relations for angular momentum operator.

b) State and explain Wigner – Eckail theorem.

Q6) a) Distinguish between Schrodirger's picture and Heissenberg's pictures.

b) Derive the equation of metion in Heissenberg pictures.

Q7) a) Obtain energy values of hydrogen atom using Klein Gorden equation.

b) Write a note on probability and current densities

Q8) Write a note on any two of the following :

a) Dirac's bra and Ket netations.

b) Einstein transition probabilities.

c) C – G coefficients

d) Dirac matrices.

(DPHY04)

Total No. of Questions : 09] **[Total No. of Pages : 1**

M.Sc. (Previous) DEGREE EXAMINATION, MAY – 2017

First Year

PHYSICS

Electronics

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

Answer any Five questions

All questions carry equal marks

Q1) a) Explain the concept of feedback in Op – amps. Draw the circuit of Op – amp with negative feedback and explain its working.

b) Write down the applications of Op – amps.

Q2) a) Draw the circuit of LC tunable oscillator and explain its working.

b) Discuss in detail about the principle and operation of Class B push – pull power amplifier.

Q3) a) Discuss in detail about the propagation of TEM waves in the coaxial line resonant cavities.

b) Give a detailed account on the construction and operation of magnetron.

Q4) a) Discuss about the propagation of waves in free space.

b) Explain the basic principles of TV transmission and reception.

Q5) a) Discuss in detail about the working of A/D converter.

b) Explain the working of data selector with a neat illustration.

Q6) a) Construct a sequential logic 1 – bit memory and explain its working.

b) Draw the block diagram and explain the operation of shift register.

Q7) a) Write down the addressing modes of Intel 8085 microprocessor.

b) Write an assembly language programme to find out the largest number in a given series of 8 – bit numbers.

Q8) a) Draw and explain the architecture of 8086 microprocessor.

b) Write down the arithmetic and logic instructions of 8086 microprocessor.

Q9) Write notes on any TWO of the following

a) Draw the block diagram of an IC regulated power supply and explain its operation.

b) Give a brief account on ground wave and sky wave propagation with examples.

c) Explain the working of encoders and decoders in digital electronics.

d) Write an assembly language programme for multiplication of two 8 – bit numbers.