(DPHY01)

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M.Sc. (Previous) DEGREE EXAMINATION, MAY – 2018

PHYSICS

First Year

Mathematical Physics

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

Answer any Five questions

All questions carry equal marks

Q1) Obtain the series solution of Legendre differential equation.

Q2) a) Using Hermite polynomial prove that

$$H_{n-1}(x) = (x-1)H_{n-2}(x) + \frac{1}{2}H_n(x)$$

b) Obtain the generating function for Lagurre polynomial.

Q3) a) State and prove Cauchy – Reimann equations.

b) Prove that $x = e^{-x}(x\sin y - y\cos y)$ is harmonic.

Q4) a) State and prove Taylor's Theorem.

b) Expand $f(z) = \sin z$ in a Taylor series about $z = \pi/4$.

Q5) a) Explain the classification of Cartesian tensors.

b) Explain the quotient law of tensor.

Q6) a) Define contravariant covariant and mixed tensors with suitable examples.

b) Explain the derivatives of a tensor.

Q7) a) Find the Laplace transform of

i) $t^2 + at + b$ and

ii) $\sinh^2 2t$

b) Evaluate $L^{-1}\left\{\frac{6s^2+22s+18}{s^3+6s^2+11s+6}\right\}$ using partial fraction method.

Q8) a) Bring out the relation between Fourier Transform and Laplace Transform.

b) Find the Fourier series for $f(x)$ in the interval $(-\pi, \pi)$ where

$$f(x) = \begin{matrix} \pi + x, & -\pi < x < 0 \\ \pi - x, & 0 < x < \pi \end{matrix}$$

Q9) Write any two of the following :

a) Prove the recurrence relation.

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

b) Jordan's inequality and Lemma.

c) Curl of covariant vector.

d) LT of Integral.

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(DPHY02)

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M.Sc. (Previous) DEGREE EXAMINATION, MAY – 2018

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) What are constraints? Classify and give examples.

b) State and explain D'Alembert's principle.

Q2) a) Explain angular momentum and kinetic energy of a rotating rigid body.

b) Derive Euler's equation of motion for a rigid body with fixed point.

Q3) a) Derive Lorentz transformation equations for relativistic motion.

b) Write a note on Lagrange and poisson brackets.

Q4) a) What are action angle variables? Solve kepler problem using action angle variables.

b) Formulate the theory of small oscillations.

Q5) a) State and explain equi – partition theorem.

b) Give a role of Gibb's paradox.

Q6) a) Explain the energy fluctuations in the canonical ensemble.

b) Obtain the equivalence between the canonical ensemble and grand canonical ensemble.

Q7) a) Explain the postulates of quantum statistical mechanics.

b) State and explain variational principle.

Q8) a) Explain the theory of white dwarf stars.

b) Obtain an expression for the internal energy of an ideal Fermi gas.

Q9) Write any two of the following :

a) Lagranges equations from Hamilton principle.

b) Canonical invariance

c) Density fluctuations in grand canonical ensemble.

d) Bose – Einstein condensation.

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(DPHY03)

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M.Sc. (Previous) DEGREE EXAMINATION, MAY – 2018

First Year

PHYSICS

Quantum Mechanics

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

Answer any Five questions.

All questions carry equal marks

Q1) a) Explain the significance of wave functions and their interpretation.

b) Explain Dirac's bra and ket notations.

Q2) a) What are stationary states? Explain.

b) Obtain the solution of wave equation for a rigid rotator.

Q3) a) Explain the stark effect in hydrogen atom

b) Obtain the ground state of helium atom using Variation method.

Q4) a) Briefly explain time dependent perturbation theory.

b) Write a note on Einstein transition probabilities.

Q5) a) Define angular momentum operator and obtain the commutation relations between them.

b) Obtain Eigen values for L^2 and L_z

Q6) a) Derive pauli's spin matrices.

b) State and explain Wignas – Eekart theorem.

Q7) a) Obtain equation of motion in Heisen berg's picture.

b) Explain the correspondence between Schrodinger's and Heisenberg's pictures.

Q8) a) Obtain the Dirac's relativistic equation for a free particle.

b) Write a note on Negative energy states.

Q9) Write notes on any two of the following :

a) Uncertainty principle

b) WKB method

c) CG coefficients

d) Probability and current densities.

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(DPHY04)

Total No. of Questions : 9] **[Total No. of Pages : 2**

M.Sc. (Previous) DEGREE EXAMINATION, MAY – 2018

PHYSICS

First Year

Electronics

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

Answer any Five questions.

All questions carry equal marks

Q1) a) Explain the working of operational amplifier with block diagram.

b) What is CMRR? Explain.

Q2) a) Explain the working of Wien's bridge oscillator with block diagram.

b) Give an account on the operation of class B push full amplifier with wave forms.

Q3) a) Define microwaves and discuss the application of Maxwell's equations in the rectangular wave guides.

b) With a neat block diagram explain the working of Magic T attenuator.

Q4) a) Define Frequency modulation and discuss the production and detection of FM waves.

b) Discuss about the propagation of ground wave and sky wave.

Q5) a) Draw the circuit diagrams of NAND, NOR and exclusive OR logic gates and explain its working with the help of truth tables.

b) Explain the working of a multiplexer encloser with neat diagram.

Q6) a) Explain the working of RS and JK flip – flops with block diagrams.

b) With a neat block diagram explain the operation of A/D converter.

Q7) a) Explain the architecture and pin configuration of 8085.

b) Write an assembly language program for multiplication of two 8 bit numbers.

Q8) a) Explain the architecture of 8086 and explain the operation of each pin.

b) Explain the instruction set of 8086.

Q9) Write notes on any two of the following :

a) Phase shift oscillator

b) Foster seelay discriminator

c) Shift register

d) Addressing modes of 8085.

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