

(DPHY01)

M.Sc. DEGREE EXAMINATION,

DECEMBER 2019.

First Year

Physics

MATHEMATICAL PHYSICS

Time : Three hours

Maximum : 70 marks

Answer any FIVE questions.

All questions carry equal marks.

1. Obtain the series solution of Bessel's differential equation.
2. (a) Obtain the generating function for Legendre's polynomial.
(b) Prove that $P_n^1(1) = \frac{1}{2}n(n+1)$.
3. (a) State and explain Cavity's integral theorem.
(b) Prove that the function $u = 2x(1-y)$ is harmonic.
4. (a) State and explain Laurent's theorem.
(b) Explain $f(z) = \ln(1+z)$ in a Taylor series about $z = 0$.

5. (a) Explain about symmetric and antisymmetric Cartesian tensors.
 (b) Explain the quotient law of tensor.
6. (a) Explain the transformation laws of Christoffel symbols.
 (b) Obtain the curl of covariant vector.
7. (a) Obtain the Laplace transform of a derivative.
 (b) Find $L^{-1}\left\{\frac{1}{(s-2)} + \frac{2}{s+5} + \frac{6}{s^4}\right\}$.
8. (a) Find the Fourier series for the function $f(x) = x^2$ for $-\pi \leq x \leq \pi$.
 (b) Find the Fourier transform
- $$f(x) = \begin{cases} 1 & |x| \leq a \\ 0 & |x| > a \end{cases}$$
9. Write the TWO of the following :
- (a) Show that $H_n^{-1}(x) = 2xH_n(x) - H_{n+1}(x)$.
 (b) Explain Jordan's inequality and lemma.
 (c) Laplacian operator in Riemann space.
 (d) Show that $F\{f(x)\} = f(s)$, if $F(x) \rightarrow 0$ as $x \rightarrow \pm\infty$. Where $f(s)$ is the FT of $f(x)$.

(DPHY 02)

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CLASSICAL MECHANICS AND STATISTICAL
MECHANICS

Time : Three hours

Maximum : 70 marks

Answer any FIVE questions.

1. (a) State and explain D'Alembert's principle.
(b) Write a note on cyclic coordinates.
2. (a) Explain about the centripetal acceleration.
(b) Obtain the angular momentum and Kinetic energy of a rotating rigid body.
3. (a) Obtain the Force and energy equations in relativistic mechanics.
(b) Define Lagrange and Poisson brackets and explain their canonical invariance.
4. (a) Explain the Action-Angle variables in the Kepler problem.
(b) Explain the vibration of a linear triatomic molecule.
5. (a) Explain the postulates of classical mechanics.

- (b) Write a note on classical ideal gas and Gibb's paradox.
 - 6. (a) Explain about the microcanonical, canonical and grand canonical ensembles.
(b) Explain the density fluctuations in the grand canonical ensembles.
 - 7. (a) Explain the third law of thermodynamics.
(b) Discuss Darwin Fowler method.
 - 8. (a) Obtain the equations of state of an ideal fermi gas.
(b) Bose-Einstein condensation.
 - 9. Answer any TWO of the following:
 - (a) Principle of least action
 - (b) Lorentz transformations
 - (c) Equi-partition theorem
 - (d) Theory of white dwarf stars.
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(DPHY 03)

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QUANTUM MECHANICS

Time : Three hours

Maximum : 70 marks

Answer any FIVE questions.

All questions carry equal marks.

1. (a) Explain the basis postulates of quantum mechanics.
(b) Explain the ortho normalities of Eigen functions.
2. (a) Explain Dirac's bra and Ket notations.
(b) State and explain Ehrenfest – Theorem.
3. (a) Obtain solution of wave equation for a linear harmonic oscillator.
(b) Briefly explain the time independent perturbation theory.
4. (a) Explain WKB method.

- (b) Write a note on sudden and adiabatic approximation.
 - 5. (a) Obtain the Eigen values for L_z and L_x .
 - (b) Explain Pauli's spin matrices.
 - 6. (a) Define total angular momentum and obtain the explicit matrices for J_x and J_y .
 - (b) State and explain Wigner. F. C. Kast theorem.
 - 7. (a) Obtain an equation of motion in Heisenberg picture.
 - (b) Obtain Schrodinger relativistic equation.
 - 8. (a) Obtain Dirac's relativistic equation for a free particle.
 - (b) Write a note on probability and current densities.
 - 9. Write notes on any TWO of the following:
 - (a) Stationary states
 - (b) Variation method
 - (c) Chesbach Gordon co-efficients
 - (d) Dirac matrices.
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(DPHY 04)

M.Sc. DEGREE EXAMINATION,
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ELECTRONICS

Time : Three hours

Maximum : 70 marks

Answer any FIVE questions.

All questions carry equal marks.

1. (a) Explain the effect of feed back on output resistance and band width in operational amplifier.
(b) Explain application of op-amp in voltage follower.
2. (a) Explain the working of LC taxable oscillator with block diagram.
(b) Explain the generation of triangular wave using 555 Timer.
3. (a) Explain the application of Maxwell's equations in the rectangular wave guides.
(b) Explain the working of magic T attenuator.
4. (a) Define AM and explain generation of AM waves.
(b) Explain the working of Foster-seelay discriminator.
5. (a) Explain NAND, NOR and Exclusive OR with their truth tables.

- (b) Explain the working of Data selector.
 - 6. (a) Explain the operations of JK and RS Flip-flops.
(b) Write a note on synchronous and asynchronous counters.
 - 7. Discuss the architecture of 8085 microprocessor with pin description.
 - 8. (a) Explain the addressing modes of 8085.
(b) Write a assembly language program to get the sum of two binary numbers.
 - 9. Write any TWO of the following:
 - (a) Class B pushfull power amplifier
 - (b) Ground wave and sky wave propagation
 - (c) A/D converter
 - (d) Architecture of 8086.
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