PG-AS-443 **MPHS-11**

P.G. DEGREE EXAMINATION – JULY, 2022.

Physics

(From CY – 2020 onwards)

First year

CLASSIC MECHANICS

Time : 3 hours Maximum marks : 70

PART A — ($5 \times 5 = 25$ marks)

Answer any FIVE questions out of Eight questions each in 300 words.

All questions carry equal marks

1. Explain the conservations of linear and angular momenta.
2. Give an account of the theory of canonical transformations.
3. Obtain an expression for Hamilton-Jacobi equation.
4. Discuss torque free motion of a rigid body.
5. Solve Kepler problem.
6. Write a note on centre of mass for a system of particles.

7. Explain cyclic coordinates and conservation theorem.

8. Define Euler angle and derive an expression of Euler's theorem.

PART B — ($3 \times 15 = 45$ marks)

Answer any THREE questions out of Five questions each in 1,000 words.

All questions carry equal marks.

9. Derive an expression of Lagrange equations of motion for a free particle in space and discuss atwood's machine with a neat sketch.

10. Show that the Lagrange's equation can be derived from Hamilton's principle for nonholonomic system and explain poisson brackets.

11. Explain action and angle variables. Derive an expression the frequency of one dimensional harmonic oscillator.

12. Derive an expression for the Coriolis force. Explain the force free motion of a symmetrical top.

13. Write a note on (a) Scattering in a central force field (b) Viral theorem.

———————

PG–AS-444 MPHS–12

P.G. DEGREE EXAMINATION — JULY 2022.

Physics

(From CY – 2020 Onwards)

First Semester

MATHEMATICAL PHYSICS – I

Time : 3 hours Maximum marks : 70

PART A — (5 × 5 = 25 marks)

Answer any FIVE questions out of Eight Questions in 300 words.

All questions carry equal marks.

1. Find the components of a vector $\vec{A} = 2y\hat{i} - 3\hat{j} + 2z\hat{k}$ in cylindrical polar coordinate system.

2. Find the eigen value of the matrix $A = \begin{pmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{pmatrix}$.

3. Show that any tensor of rank 2 can be expressed as a sum of a symmetric and an anti symmetric tensor both of rank 2.

4. Determine whether $f(z) = \sin z$ is analytic or not.

5. Show that the group formed by the set $\{1, \omega, \omega^2\}$, is being cube roots of unity i.e $\omega^3 = 1$, cyclic group of order 3 with respect to multiplication.

6. Show that the vectors $\hat{i} + 2\hat{j} - 3\hat{k}, \hat{i} - 3\hat{j} + 2\hat{k}$ and $2\hat{i} - \hat{j} + 5\hat{k}$ are linearly independent.

7. Determine the rank of the matrix $A = \begin{pmatrix} 1 & 4 & 5 \\ 2 & 6 & 8 \\ 3 & 7 & 12 \end{pmatrix}$.

8. Find the Laurent series of the function $f(z) = \dfrac{1}{(1 - z^2)}$ with center at $z = 1$.

PART B — $(3 \times 15 = 45$ marks)

Answer any THREE questions out of Five Questions in 1000 words.

All questions carry equal marks.

9. State and prove Gauss' divergence theorem.

10. Find the characteristic equation of the following matrix and verify the Cayley-Hamilton theorem $\begin{pmatrix} 1 & 2 & 3 \\ 2 & -1 & 4 \\ 3 & 1 & 1 \end{pmatrix}$.

11. (a) State and prove quotient law of tensors.

    (b) Discuss the addition and subtraction operations of tensors with examples.

12. (a) State and prove Cauchy's residue theorem.

    (b) Find the residue of the function $\frac{1}{(z^2+1)^2}$ at its poles.

13. What are reducible and irreducible representations of groups? Obtain the character table for C_{3v} point group.

———————

PG–AS-445 **MPHS–13**

P.G. DEGREE EXAMINATION — JULY 2022.

Physics

(From CY – 2020 onwards)

First Semester

LINEAR AND INTEGRATED ELECTRONICS

Time : 3 hours Maximum marks : 70

PART A — (5 × 5 = 25 marks)

Answer any FIVE questions out of Eight questions each in 300 words.

All questions carry equal marks.

1. Explain PN junction diode with a neat diagram.

2. Describe the principle and working of JFET.

3. Sketch Schmitt trigger and explain its working.

4. Difference between static RAM and dynamic RAM.

5. State the need for D/A conversion.

6. Differentiate V to I and I to V convertor.

7. Explain the principle and operation of PLA.

8. Briefly explain two port network.

PART B — ($3 \times 15 = 45$ marks)

Answer any THREE questions out of Five questions each in 1000 words.

All questions carry equal marks.

9. Explain the types of diodes and its applications.

10. Sate and prove thevenin's and norton's theorem.

11. Construct the different types of operational amplifier in arithmetic form.

12. Explain the principle, construction and working of CCD and its applications.

13. Describe with neat diagram voltage to frequency and voltage to time conversion and write down its importance.

———————

PG-AS-446 MPHSEL-1

P.G. DEGREE EXAMINATION — JULY, 2022.

Physics

(From CY–2020 onwards)

First Semester

NUMERICAL METHODS

Time : 3 hours Maximum marks : 70

PART A — ($5 \times 5 = 25$ marks)

Answer any FIVE questions out of Eight questions each in 300 words.

All questions carry equal marks.

1. Explain Spline interpolation.

2. Locate root of the equation $x^2 - x - 2 = 0$ using fixed point method.

3. Give the algorithm of Jacobi iteration method.

4. Compare the integral $\int_1^1 e^x dx$ using composite trapezoidal rule for $n = 2$ and $n = 4$.

5. Given the equation $dy/dx = 3x^2 + 1$ with $y(1) = 2$ estimate $y(2)$ by Euler's method using $h = 0.5$ and $h = 0.25$.

6. Solve the following equations $2x_1 + x_2 = 25$; $2.001x_1 + x_2 = 25.01$ and thereby discuss the effect of ill conditioning.

7. Give the algorithm of Gauss Jordan elimination.

8. Find the root of the equations $f(x) = x^2 - 3x + 2$ in the vicinity of $x = 0$ using Newton Raphson method.

PART B — $(3 \times 15 = 45$ marks)

Answer any THREE questions out of Five questions each in 1000 words.

All questions carry equal marks.

9. Find the Lagrange interpolation polynomial to fit the following data.

i	0	1	2	3
x_i	0	1	2	3
$e^{xi} - 1$	0	1.7183	6.3891	19.0853

10. Determine the roots of equations $x^2 + xy = 6$ $x^2 - y^2 = 3$ using Newton Raphson method.

11. Solve the following system of equations by process of elimination

$3x + 2y + z = 10$ use the
$2x + 3y + 2z = 14$
$x + 2y + 3z = 14$

12. Evaluate the integral $I = \int_a^b (x^3 + 1)dx$ for the intervals

(a) (1,2)
(b) (1,1.5)

Also estimate the truncation error in each case and compare the results with the exact error.

13. Use the classical RK method to estimate $y(0.4)$ when $y(x) = x^2 + y^2$ with $y(0) = 0$. Assume $h = 0.2$.

PG–AS-447 **MPHS–21**

P.G. DEGREE EXAMINATION — JULY 2022.

Physics

(From CY – 2020 onwards)

Second Semester

MATHEMATICAL PHYSICS – II

Time : 3 hours Maximum marks : 70

PART A — ($5 \times 5 = 25$ marks)

Answer any FIVE questions out of Eight questions in 300 words.

All questions carry equal marks.

1. Solve the differential equation $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = 0$.

2. Show that $xJ_n'(x) = nJ_n(x) - xJ_{n+1}(x)$.

3. Obtain the Rodrigue's formula $L_n(x) = \frac{e^x}{n!}\frac{d^n}{dx^n}(x^n e^{-x})$.

4. Obtain the solution of wave equation $\frac{\partial^2 y}{\partial x^2} = \frac{1}{c^2}\frac{\partial^2 y}{\partial t^2}$.

5. Find

   (a) $L\{\sinh at\}$

   (b) $L^{-1}\left\{\frac{1}{s^2(s^2+\omega^2)}\right\}$.

6. Show that $\Gamma(n+1) = n\Gamma(n)$.

7. Show that

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

8. State and explain shifting and change of scale properties of Laplace transform.

PART B — $(3 \times 15 = 45$ marks)

Answer any THREE questions out of Five questions in 1000 words.

All questions carry equal marks.

9. Find the solution of the differential equation $\frac{d^2y}{dx^2} - y = x\sin x + (1+x^2)e^x$.

10. Obtain the polynomial solution of Legendre's differential equation

$$(1-x^2)\frac{d^2y}{dx^2} - 2x\frac{dy}{dx} + n(n+1)y = 0.$$

11. Show that $\int_{-\infty}^{+\infty} e^{-x^2} H_m(x) H_n(x) dx = 2^n n! \sqrt{\pi \delta_{mn}}$.

12. Solve the two - dimensional heat flow equation $\nabla^2 u = \frac{1}{h^2} \frac{\partial u}{\partial t}$ under steady state condition.

13. (a) State and explain linearity theorem of Fourier transform.

    (b) Find the Fourier sine transform of $\frac{e^{-ax}}{x}$.

PG-AS-448 **MPHS–22**

P.G. DEGREE EXAMINATION - JULY 2022

Physics

(From CY- 2020 onwards)

Second Semester

QUANTUM MECHANICS-I

Time : 3 hours Maximum marks : 70

PART A — ($5 \times 5 = 25$ marks)

Answer any FIVE questions out of eight questions in 300 words.

All questions carry equal marks

1. Explain eigen value and eigen function with example.

2. Describe quantum mechanical tunnelling with a neat diagram.

3. Explain the properties of stationary waves.

4. Compute [Jx, Jy].

5. Outline the basic principle of Born-approximation.

6. What are identical particles? Give the significance of identical particles in quantum mechanics.

7. Explain normalised and orthogonal wave functions.

8. Difference between resonant and non-resonant scattering.

PART B — ($3 \times 15 = 45$ marks)

Answer any THREE questions out of five questions in 1000 words.

All questions carry equal marks

9. State and prove Ehrenfest's theorem in quantum mechanics.

10. Derive time independent Schrodinger wave equation and hence prove particle in a square well potential.

11. Obtian energy eigen values of one dimensional and 3-dimensional harmonic oscillator.

12. Write a note on Hilbert-space and Dirac's Bra-ket notation.

13. State and prove Optical theorem.

———————

PG–AS-449 **MPHS–23**

P.G. DEGREE EXAMINATION — JULY, 2022.

Physics

(From CY – 2020 onwards)

Second Semester

ELECTROMAGNETIC THEORY

Time : 3 hours Maximum marks : 70

PART A — (5 × 5 = 25 marks)

Answer any FIVE questions out of Eight questions in 300 words.

All questions carry equal marks

1. Derive Poisson's equation and Laplace equation.

2. Derive expression for magnetic vector potential.

3. Explain Faraday's law of electromagnetic induction.

4. Explain energy and momentum in electromagnetic waves.

5. Explain the boundary conditions at the surface of discontinuity.

6. Describe the work done due to move a point charge.

7. Derive Ampere's law in magnetized material.

8. Obtain the coulomb and Lorentz gauge.

PART B — $(3 \times 15 = 45$ marks)

Answer any THREE questions out of Five Questions in 1000 words.

All questions carry equal marks.

9. Obtain the solution to Laplace equation in spherical polar coordinates.

10. Discuss the effect of a magnetic field on an atomic orbit.

11. Derive Maxwell's equation in free space and linear isotropic media.

12. Derive an expression for the guide wavelength of TE mode propogation in hollow rectangular wave guide.

13. Obtain Fresnel's equations and explain with neat diagram.

———————

PG-AS-450 MPHSEL - 2

P.G. DEGREE EXAMINATION – JULY 2022.

Physics

(From CY – 2020 onwards)

Second Semester

MICROPROCESSOR AND MICROCONTROLLER

Time : 3 hours Maximum marks : 70

PART A — (5 × 5 = 25 marks)

Answer any FIVE questions out of eight questions each in 300 words.

All questions carry equal marks.

1. Explain the memory interfacing in microprocessor 8085.

2. Describe the logical operations in 8085.

3. Write a note on operating modes of 8086 microprocessor.

4. Explain the different operand addressing in 8051 microcontroller.

5. Explain the interface of digital to analog conversion.

6. Explain about vectored and non vectored interrupts.

7. Give an account of control transfer instruction.

8. Explain about interrupt priorities in 8086.

PART B — (3 × 15 = 45 marks)

Answer any THREE questions out of five questions each in 1000 words.

9. Write about the instruction format in microprocessor 8085.

10. Explain about subroutine CALL and RETURN instructions in Intel 8085.

11. Explain maximum mode and minimum mode pin function assignments in microprocessor 8086.

12. Describe data transfer instructions and branching instructions in 8051.

13. Explain the direct memory access controller in 8257.

———————