

# DUMKAL COLLEGE

DEPARTMENT OF PHYSICS

1<sup>st</sup> semester Major

Mathematical physics-1 [PHY-M-T-1] Date: 19/12/2024

Write an Assignment on Vector Differentiation

1. Define directional derivatives and normal derivatives.
2. Define gradient of a scalar field and explain its geometrical interpretation.
3. Define divergence and curl of a vector field. ]

# DUMKAL COLLEGE

DEPARTMENT OF PHYSICS

1<sup>st</sup> semester SEC-1

Electrical circuit and Network Skills [PHY-SEC-T-1] Date: 19/12/2024

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Write an Assignment on Electric Motors. [Single-phase, three-phase & DC motors. Basic design. Speed & power of ac motor.]

# DUMKAL COLLEGE

DEPARTMENT OF PHYSICS

1<sup>st</sup> semester Minor

Mathematical Physics-1 [PHY-MI-T-1]

Full Marks: 10      Times: 30 Minutes      Date: 19/12/2024

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Each question carries 2 marks:

1. Consider the differential equation  $x \frac{dy}{dx} + 2y = \frac{\cos \pi x}{x}$  If  $y(1) = 1$ , then find the value of  $y(2)$ .

2. Find the Taylor series expansion of  $f(x) = \frac{1}{1-x}$  At  $x = 0$ .

Or, Find the Taylor series expansion of  $f(x) = \sinh x$  at  $x = 0$

3. Plot the functions (i)  $y = \frac{a}{bx^2-c}$  (ii)  $y = A(a^2 - x^2)$

Or, Plot the functions (i)  $y = |x - 3|$  (ii)  $y = \cosh x$

4. Find the projection of the vector  $\vec{A} = \hat{i} - 2\hat{j} + 3\hat{k}$  On the vector  $\vec{B} = \hat{i} + 2\hat{j} + 2\hat{k}$ .

Or, Find the angle between  $\vec{A} = 2\hat{i} + 2\hat{j} - \hat{k}$  And  $\vec{B} = 7\hat{i} + 24\hat{k}$

5. Find grad  $\varphi$  if  $\varphi = \ln|r|$

# **DUMKAL COLLEGE**

**DEPARTMENT OF PHYSICS**

**3<sup>rd</sup> semester Major**

**Electricity and Magnetism [PHS-M-T-3] Date: 20/12/2024**

Write an Assignment on Ampere's Circuital Law.

[State and Proof Ampere's Circuital Law. Application of Ampere's Circuital Law to (i) infinite straight wire, (ii) infinite planar surface current (iii) Solenoid and (iv) Toroid.]

# **DUMKAL COLLEGE**

**DEPARTMENT OF PHYSICS**

**3<sup>rd</sup> semester SEC-03**

**Renewable Energy and Energy Harvesting [PHS-SEC-T-3] Date: 20/12/2024**

Write an Assignment on Geothermal Energy

[Geothermal energy (Basic idea), Geothermal sources, Applications of geothermal energy, advantages and disadvantages of geothermal energy.]

# **DUMKAL COLLEGE**

**DEPARTMENT OF PHYSICS**

**3<sup>rd</sup> semester Minor**

**Electricity and Magnetism [PHS-MI-T-3]**

**Full Marks: 10      Times: 30 Minutes      Date: 20/12/2024**

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**Each question carries 2 marks:**

1. Calculate electric field at any axial point due to a uniformly charged ring.
2. What is electric potential calculate electric potential at any point due to a point charge.
3. Two point charges  $q$  is placed at a distance  $r$  from each other find the points where electric field is zero.
4. Write down Maxwell's equations in a dielectric medium.
5. Write down two differences between conduction current density and displacement current density.

# **DUMKAL COLLEGE**

**DEPARTMENT OF PHYSICS**

**5<sup>th</sup> semester Honours**

**Quantum Mechanics & Applications [PHY-H-CC-T-11] Date: 20/12/2024**

Write an Assignment on 'Normal and Anomalous Zeeman Effect. Paschen Back and Stark Effect' [15]

# **DUMKAL COLLEGE**

**DEPARTMENT OF PHYSICS**

**5<sup>th</sup> semester Honours**

**Statistical Mechanics [PHY-H-CC-T-12] Date: 20/12/2024**

Write an Assignment on 'Fermi-Dirac Statistics: Fermi-Dirac Distribution Law, Thermodynamic functions of a completely and strongly Degenerate Fermi Gas.] [15]

# **DUMKAL COLLEGE**

**DEPARTMENT OF PHYSICS**

**5<sup>th</sup> semester Honours**

**Classical Dynamics [PHY-H-DSE-T-01] Date: 21/12/2024**

Write and Assignment on Geometrical interpretation Space-time: Minkowski space. The invariant interval, light cone and world lines. Space-time diagrams. [15]

# **DUMKAL COLLEGE**

**DEPARTMENT OF PHYSICS**

**5<sup>th</sup> semester Honours**

**Nuclear and Particle Physics [PHY-H-DSE-T-02] Date: 21/12/2024**

Write an Assignment on Nuclear Liquid drop model [Approach, semi empirical mass formula and significance of its various terms, condition]

# **DUMKAL COLLEGE**

**DEPARTMENT OF PHYSICS**

**5<sup>th</sup> semester Programme**

**Elements of Modern Physics [PHY-G-DSE-T-01] Date: 21/12/2024**

Write an Assignment on Radioactivity [Stability of nucleus; Law of radioactive decay: Mean life and half-life]

# **DUMKAL COLLEGE**

**DEPARTMENT OF PHYSICS**

**5<sup>th</sup> semester Programme**

**Electric Circuit & Network Skills [PHY-G-SEC-T-03] Date: 21/12/2024**

Write an Assignment on Electric Motors [Single-phase, three-phase & DC motors. Basic design. Interfacing DC or AC sources to control heaters & motors. Speed & power of ac motor]