

FY B. Sc.

School of Science

Semester II

PHS 102

Physics-II

Max Marks: 100

May 2018

End Semester Examination (ESE)

Time: 3 Hrs.

22/518

10:30 AM to 1:30 PM.

- Instructions for Students:**
- 1) Use of non-programmable calculator is allowed
 - 2) All questions are compulsory

Q1	Objective Questions	Marks	COs
a)	Multiple Choice Questions	10	All
i)	Energy stored in the magnetic field is _____.	01	102.4
	a) $\frac{1}{2} LI^2$ b) $\frac{1}{2} L^2 I^2$ c) $\frac{1}{2} L^2 I$ d) $\frac{1}{2} LI$		
ii)	Ampere's law in differential form is _____.	01	102.3
	a) $\nabla \times B = \epsilon_0 J$ b) $\nabla \times B = \frac{J}{\epsilon_0}$ c) $\nabla \times B = \frac{J}{\mu_0}$ d) $\nabla \times B = \mu_0 J$		
iii)	Stoke's theorem gives the relationship between a surface integral and _____.	01	102.1
	a) line integral b) surface integral c) volume integral d) all of these		
iv)	Gauss law states that the total electric flux through a closed surface enclosing a charge is equal to _____ times the magnitude of the charge enclosed.	01	102.2
	a) $1/\epsilon_0$ b) ϵ_0 c) 0 d) none of these		
v)	According to Biot-Savart's law, the magnetic induction dB at a point due to a current element, at a distance r is _____.	01	102.3
	a) $dB \propto r^2$ b) $dB \propto \frac{1}{r^2}$ c) $dB \propto \frac{1}{\sqrt{r}}$ d) $dB \propto \frac{1}{r^3}$		
vi)	Gradient of $\Phi =$ _____.	01	102.1
	a) $\nabla\Phi$ b) $\nabla.\Phi$ c) $\nabla\times\Phi$ d) 0		
vii)	The energy density stored in the electric field between the	01	102.2

plates of a charged capacitor, is given by _____.

a) $u_E = \frac{\epsilon_0}{2} E^2$ b) $u_E = \frac{1}{2} E^2$ c) $u_E = E^2$ d) $u_E = 0^2$

viii) The fundamental equations of electromagnetic theory are _____ 01 102.4

- a) Faraday's equations b) Maxwell's equations
c) Einstein's equations d) Lorentz's equations

ix) The magnetic induction at any point along the axis of an infinite solenoid is proportional to _____ 01 102.3

- a) number of turns per unit length b) number of turns
c) length of the solenoid d) all of these

x) Poynting vector is given as _____ 01 102.4

- a) $P = E \times D$ b) $P = H \times B$ c) $P = E \times H$ d) $P = J \times D$

b) Fill in the blanks 05 All

i) Electric field due to a uniformly charged spherical shell when point P lies outside the shell is given by _____ 01 102.2

ii) _____ theorem use the curl operation. 01 102.1

iii) According to Faraday's law, EMF stands for _____ 01 102.4

iv) Ampere's theorem applies only when _____ current is passing. 01 102.3

v) Coulomb law is employed in _____ 01 102.2

c) True or False 05 All

i) The induced current will oppose the flux producing it. 01 102.4

ii) The triple integral is used to compute volume. 01 102.1

iii) The magnetic vector potential is a scalar quantity. 01 102.3

iv) Gradient of a function is a constant. 01 102.1

v) Gauss law for electric field uses surface integral. 01 102.2

Q2 Answer the following questions

Marks COs

a) Discuss the integration of vectors. 10 102.1

- b) Prove that $\text{grad } \phi = \nabla \phi$. 06 102.1

OR

- b) Explain the physical significance of divergence of a vector. 06 102.1
c) If $A = x^2y \mathbf{i} + 2xyz^2 \mathbf{j} - 2xz^3 \mathbf{k}$, find curl A at (1, 2, -1) 04 102.1

Q3

Answer the following questions

Marks COs

- a) Derive an expression for the electric potential due to an electric dipole and charged sphere. 10 102.2
b) Explain Gauss law in electrostatics. 06 102.2

OR

- b) Explain the concept of a parallel plate capacitor. 06 102.2
A hollow sphere of radius 20 cm is charged with a charge of 30×10^{-9} C. Find the potential at a distance of 50 cm from the sphere center. 04 102.2

Q4

Answer the following questions

Marks COs

- a) State and explain Ampere's Theorem. Calculate the magnetic field of a solenoid carrying current. 10 102.3
b) Explain ferromagnetic substances and hysteresis loop. 06 102.3

OR

- b) Show that $\nabla \cdot \mathbf{B} = 0$. 06 102.3
c) A magnetic material has a magnetization of 2300 A/m and produces a flux density of 0.00314 Wb/m^2 . Calculate magnetizing force and relative permeability of the material. 04 102.3

Q5

Answer the following questions

Marks COs

- a) Derive equations of EM wave for E and B fields in a vacuum. 10 102.4
b) State and explain Lenz's law. 06 102.4

OR

- b) Derive an expression for the self inductance of a solenoid. 06 102.4
c) Give the physical significance of Maxwell's equations. 04 102.4
