Roll No…….. **Total No. of Printed Pages: 1**
Total No. of Questions: [09]

B. Sc. M. Sc. (Forensic Science) (Semester – 2nd)
ELECTRICITY, MAGNETISM AND EMT
Subject Code: BSNMS1202
Paper ID: [23480117]

Time: 03 Hours **Maximum Marks: 60**

Instruction for candidates:

1. Section A is compulsory. It consists of 10 parts of two marks each.
2. Section B consist of 5 questions of 5 marks each. The student has to attempt any 4 questions out of it.
3. Section C consist of 3 questions of 10 marks each. The student has to attempt any 2 questions.

Section – A **(2 marks each)**

Q1. Attempt the following:

a) Prove that curl of the grad of U is Zero.
b) State Stoke's theorem of vectors.
c) Show that no work is done in moving a test charge over an equipotential surface.
d) Why electric field inside a spherical shell is Zero?
e) State Faraday's laws of electromagnetism.
f) Distinguish between Diamagnetic, Paramagnetic and Ferromagnetic substances.
g) Calculate the magnetic field at a distance of 5 m from an infinite straight conductor carry current of 100 A.
h) What is displacement current?
i) Write a note on polarization.
j) Discuss the effect of dielectric on the capacitance of a parallel plate capacitor.

Section – B **(5 marks each)**

Q2. Prove that $\nabla.(\frac{\vec{r}}{r^3}) = 0$, where $\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$.

Q3. Given the electric field in a region of space is $\vec{E} = 2x\hat{i} + 2y\hat{j} + z\hat{k}$. Calculate the volume density of charge.

Q4. Drive an expression for the electrostatic energy per unit volume in a charged capacitor filled with a dielectric medium.

Q5. State and prove Ampere circuital law of magnetic field and show that $\vec{\nabla} x \vec{B} = \mu_o \vec{J}$.

Q6. Write Maxwell's equations and give the physical significance of each one.

Section – C **(10 marks each)**

Q7. Drive Gauss's theorem in the differential form. Use this theorem to calculate the electric field strength of an infinite homogenously charged solid sphere.

Q8. Show that the energy stored per unit volume in the magnetic field B set up in a solenoid is $\frac{B^2}{2\mu_o}$.

Q9. Discuss the electromagnetic wave propagation through vacuum and obtain the expression for velocity of electromagnetic wave in vacuum.