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Total No. of Printed Pages: 1

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**B. Sc. (Non-Medical) (Semester – 2nd)**  
**ELECTRICITY, MAGNETISM AND EMT (CORE COURSE-IV)**  
**Subject Code: BSNMS1202**  
**Paper ID: [22131408]**

**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) Define Stoke's theorem of vector and give its physical significance.
- b) What is the gradient and give its significance?
- c) What do you mean by displacement vector?
- d) Define dielectrics and write their properties.
- e) Explain Ampere's circuital law.
- f) Differentiate between divergence and curl of magnetic field.
- g) Distinguish between scalar and vector potential.
- h) Explain Lenz's law.
- i) What do you mean by displacement current? Is it due to free charge carriers?
- j) Show that electromagnetic waves are transverse in nature.

**Section – B**

**(5 marks each)**

- Q2. If  $\vec{r}$  and  $r$  have their usual meaning, show that  $\text{div} (r^n \vec{r}) = (n + 3)r^n$
- Q3. Derive the expression for electric potential of a dipole.
- Q4. State and explain Bio-Savart's law in magnetostatic.
- Q5. Define electromagnetic induction and explain Faraday's law of electromagnetic induction.
- Q6. Derive Maxwell's equation and explain the physical significance of each equation.

**Section – C**

**(10 marks each)**

- Q7. a) Calculate the electric field due to an infinite line of charge
- b) Evaluate  $\nabla^2 r$  where  $r = \sqrt{x^2 + y^2 + z^2}$ .
- Q8. a) A solenoid 4m long and of mean diameter 8cm has 104 turns. If a current of 5A is flowing through it, calculate the magnetic field at its centre.
- b) Calculate the expression for energy stored in magnetic field.
- Q9. a) Define Poynting vector and deduce the Poynting theorem for the flow of energy in an electromagnetic field.
- b) Differentiate between ferromagnetic, paramagnetic and diamagnetic materials.