Uni. Roll NO.:- .....

SET-A

GLA University, Mathura

Course:- B.Tech. I-Year, II-Mid Term (Even Sem.) Examination, 2012-13

Subject:- Physics-II (AHP-102)

Time:- 90 Minutes M.M.:- 20

Note:-

Answer all questions from Group A (which is) **compulsory, Any Two** from Group B and **Any Two** from Group C.

Group –A (All Questions are compulsory) 08x0.5=04

Q1. **(i) The concept of displacement current was proposed by**

- Maxwell
- Faraday
- Ampere
- Gauss

(ii) Maxwell's modified Ampere's Law is valid

- Only when electric field varies with time
- Only when electric field is static
- In both of the above situations
- None of these

(iii) The Maxwell's equation which interprets that isolated magnetic poles do not exist is

- $divE = \rho/\varepsilon_0$
- $divB = 0$
- $curlE = -\partial B/\partial t$
- $curlB = \mu_0 J + \mu_0 \varepsilon_0 \partial E/\partial t$

(iv) If a plane electromagnetic wave is propagating along x-axis and the amplitude of electric field is along y-axis, then the magnetic field would be

- along x-axis
- along y-axis
- along z-axis
- along any direction

(v) Of the following, which one is the consequence of the maxwell's equations ?

- $B = \mu_0 H$
- $D = \varepsilon_0 E$
- $D = \varepsilon_0 E + P$
- $c = 1/\sqrt{\mu_0 \varepsilon_0}$

(vi) Which relation is true for an electromagnetic wave ?

- $B_0 = \mu_0 \varepsilon_0 cE_0$
- $B_0 = \frac{cE_0}{\sqrt{\mu_0 / \varepsilon_0}}$
- $E_0 = \mu_0 \varepsilon_0 cB_0$
- $c = \sqrt{\mu_0 / \varepsilon_0}$

(vii) "The work done on the charges by the electromagnetic force is equal to the decrease in energy stored in the field, less the energy which flowed out through the surface" is the statement of

- Gauss's theorem
- Stoke's theorem
- Gauss's divergent theorem
- Poynting theorem

(viii) The energy per unit time, per unit area transported by the electromagnetic fields is expressed as

- $\vec{S} = 1/\mu_0 (\vec{E} \times \vec{B})$
- $\vec{S} = (\vec{E} \times \vec{B})$
- $\vec{S} = \mu_0 (\vec{E} \times \vec{B})$
- $\vec{S} = 1/\varepsilon_0 (\vec{E} \times \vec{B})$

Group – B
(Attempt any two questions) 3x2=6

Q1. Explain the concept of displacement current and write the modified form of Ampere's circuital law. Also driv the equation of continuity.

Q2. A parallel plate capacitor with plate area of 5 cm^2 and plate separation 3mm has a voltage of 50 sin 10^3 t applie to its plates. Calculate the displacement current assuming $\varepsilon = 2\varepsilon_0$.

Q3. Write down the integral forms of maxwell's equations with their physical significances.

Group – C
(Attempt any two questions) 5x2=10

Q1. Write the differential forms of maxwell's equations for free space and use them to show that the plan electromagnetic waves travel in the free space with the velocity equal to the speed of light.

Q2. Obtain the equations of electric and magnetic fields of the electromagnetic wave in conducting media. Find th skin depth (δ) at a frequency of 3.0×10^6 Hz in a good conductor(aluminium), where $\sigma = 38.0 \times 10^6$ S/m and $\mu_r = 1$. Also calculate the attenuation parameter (α).

Q3. Discuss Langevin's theory for a paramagnetic gas and derive the expression of paramagnetic succeptibility for a gas system.

Physical Constants

$\mu_0 = 4\pi \times 10^{-7}$ weber/Amp-m

$\varepsilon_0 = 8.85 \times 10^{-12}$ C/N-m^2