International Islamic University Chittagong
Department of Electrical and Electronic Engineering

Assignment Examination Autumn-2019 | Program: B.Sc. Engg. (EEE)

Course Code: **EEE 3621 (Section-A+B)** | Course Title: ***Engineering Electromagnetism***

Full Marks: **5×8=40**

Time: Within **12 Hrs** from the time of Assignment launched. *Late submission may cause maximum **10** marks deduction.*

Please Answer One of the Question Groups from bellow.

****Please show the ***Calculation of Question Group Selection*** at the 1st page of answer sheet. Without calculation **two** marks will be deducted.***

Question Group-1: 1(a), 2(a), 3(a), 4(a), 5(a)*---5x8=*40 Marks

Question Group-2: 1(b), 2(b), 3(b), 4(b), 5(b)*---5x8=*40 Marks

Question Group-3: 1(a), 2(b), 3(a), 4(b), 5(a)*---5x8=*40 Marks

Question Group-4: 1(b), 2(a), 3(b), 4(a), 5(b)*---5x8=*40 Marks

Question Group Selection Process:

***LDI**=x=Last digit of student ID*

[For Question Selection: *(Last digit of Student ID=x)+(the Digit before last digit of Student ID=y)=**Z***÷2=**Result of Division (RD)**; then Do, **RD-5=**then **Modulus of the result is Your Question Number**. *If the value of* **Z=0** *, answer **Question Group-1***, if **Z=1**, answer ***Question Group-2***. Moreover, *if* **RD-5=0** answer ***Question Group*-3.**

Example: for St. ID =ET 1510**14**; St. last digit of ID=4=***x***; and the digit before last digit of ID is =1=**y**; So, **Z**=*(x+y)*=(4+1)=**5**. Now (Z÷2)=(5÷2)=2=RD. Now, (RD-5)= -3=Modulus of -3=3; So you have to Answer ***Question Group*-3**.]

1(a). *"An isolated magnetic charge does not exist",* justify the statement. **08**

Find the **magnetic field intensity** at a point (0,0, ***LDI+1***) on the axis of a circular loop of radius ***3cm*** that carries a direct current ***20mA***.

1(b). "Magneto-static field is not conservative" ", justify the statement. **08**

Figure 1. shows a conducting loop of area 20 cm^2 and resistance 4 Ω. If the time varying B = ***[(LDI+1)***$\times 10]cos10^4 t\ a_z$ mWb/m^2, find the **induced current** in the loop, where symbols have their usual meaning.

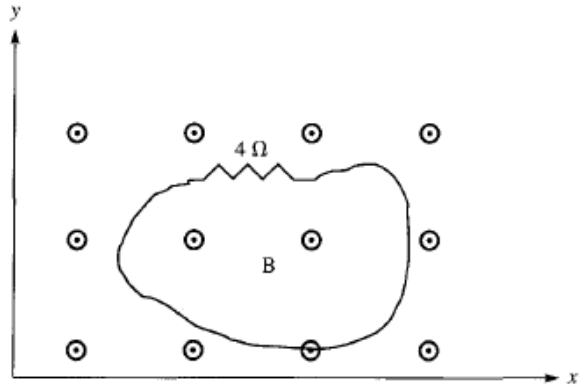

Fig.1

2(a). Electric field intensity of a linearly polarized uniform plain wave propagating in the +z direction in the lossless media is, E=a_x100 cos (10^7πt) V/m at z=0. The constitutive parameters of the media are, ϵ_r=80, μ_r=1 and σ=1.4×10^{-4} S/m. Determine the attenuation constant, phase constant, intrinsic impedance, phase velocity and wavelength. **08**

2(b). The electric field in free space is given by **08**

$E = 50\cos(10^8 t - \beta x)a_y\ V/m$. Find

i. The direction of wave propagation.
ii. Calculate β , λ and the time it takes to travel a distance $\lambda/2$, where symbols have their usual meaning.

3(a). How standing wave is formed? Explain from transmission coefficient. **08**

Suppose, wave entering from medium1 air (η_0) to medium2 conductor (η_c) and $\boldsymbol{\eta_c \gg \eta_0}$**.** Find E_t, E_r, H_t, H_r; where symbols have their usual meaning.

3(b). Differentiate between Brewster's Angle and Critical angle. **08**

Medium-1 and medium-2 lossless non-ferromagnetic dielectric where, $\mu_1=\mu_2=\mu_0$. Wave entering to conductor. Permittivity for medium-1 is ϵ_1 and permittivity for medium-2 is ϵ_2. Find, $\mathbf{E_r}$ and $\mathbf{E_t}$; where symbols have their usual meaning.

4(a). It is found that attenuation on a 50 Ω distortion less transmission line is 0.01 (dB/m). The line has a capacitance of 0.1 (nF/m). **Determine** resistance, inductance and conductance per meter of line. Also **find** the value of attenuation, resistance, inductance and conductance per meter of line **if it would be lossless** line. **08**

4(b). A 30m long lossless transmission line with Z_0=50 Ω operating at 2MHz is terminated at a load Z_L=60+j40Ω. If u=0.6c on the line, find, (1) reflection coefficient, (2) standing wave ratio (3) input impedance (4) phase constant (5) transmission coefficient. **08**

5(a). What is importance of cutoff frequency for waveguide? Why TE_{10} mode is called fundamental mode for waveguide? **08**

5(b). A waveguide, with dimensions a = [**LDI**+2] cm and b = [0.**LDI**+0.2] cm, is to be used at 20 GHz. **Determine** the wave impedance for the dominant mode when (a) the guide is empty, and (b) the guide is filled with polyethylene (whose ε_r = 2.25) **08**