Department of Electronics & Communication Engineering

NATIONAL INSTITUTE OF TECHNOLOGY, ROURKELA

END SEMESTER EXAMINATION (*Spring*) 2012

Max.Marks 50

CLASS B.Tech 6th Semester (EC/EI)

Time 3 Hours

SUBJECT Electromagnetic Theory (**EC-312**)

This question paper contains 2 pages.

*Question Nos. 1& 8 are compulsory. Answer any **five** from the rest.*
All parts of a question should be answered in one place.
Figures in the right hand margin indicate marks.

1.(a) Write down Maxwell's Equations in Time Harmonic form (both differential & integral forms) 2x5

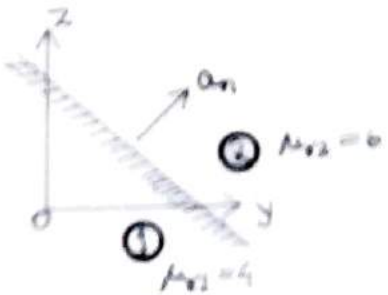
(b) What do you mean by Polarization? Explain linear polarization.

(c) The magnetic field intensity ina material is given as a phase:
$H = (\hat{x}(100 + j50) + \hat{y}50 + \hat{z}100)e^{j60}e^{-3x}$ [A/m]. Write the magnetic field intensity in rectangular form.

(d) Derive the relationship among Line impedance (Z (z)), Characteristic impedance (Z_0) and Load impedance (Z_L) in a Transmission Line.

(e) Explain Virtual height and Maximum Usable Frequency (MUF).

2. Region 1, where $\mu_{r1} = 4$, is the side of the plane $y + z = 1$ containing the origin (see figure given below). In region 2, $\mu_{r2} = 6$. $B1 = 2.0a_x + 1.0a_z$ (T). Find B_2 and H. 7



3. A radar installation transmits a wave whose magnetic field intensity is

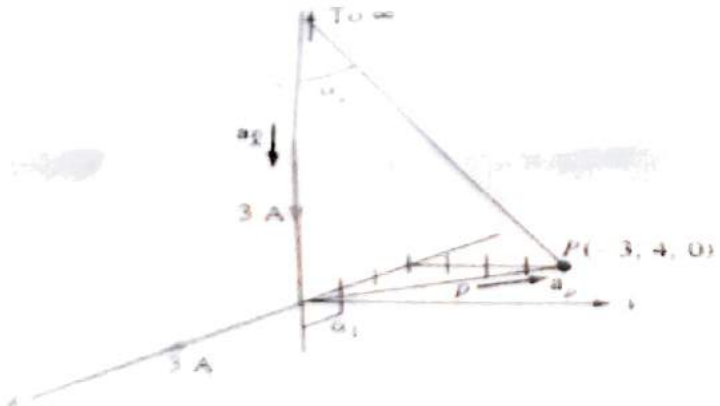
$$H = \hat{x}H_0\cos(\omega t - k_0 z)\left(\frac{A}{m}\right)$$

Where $H_0 = 25$ A/m and f=30 GHz. Propagation is in free space and z is the vertical direction. Assume plane waves and lossless propagation. Calculate

(a) The wave number for the wave

(b) The electric field intensity of the wave in phasor form.

4.	The following waves are given: (a) $H(z)= -\hat{y}H_0e^{-j\beta z}+j\hat{x}H_1e^{-j\beta z}$ (b) $H(z)= -\hat{x}H_0e^{-j\beta z}+\hat{y}2H_0e^{-j\beta z}$ Find the polarization in each case.	7
5.	A long power transmission line supplies 1500 MW at 750 kV to a matched load (that is, the load impedance equals the line impedance) (a) Suppose the load is disconnected. What is the reflection coefficient at the load? (b) Because of a fault on the line, the load changes from the matched condition to $Z_L=200+j100\Omega$. What is the reflection coefficient at the load now?	7
6.(a)	Find the potential function and the electric field intensity for the region between two concentric right circular cylinders, where V=0 at r=1 mm and V=150v at r= 20mm. Neglect fringing.	7
(b)	In a material for which σ=5.0 S/m and ε_r=1 the electric field intensity is $E=250\sin 10^{10}t$ (V/m). Find the conduction and displacement current densities, and the frequency at which they have equal magnitudes.	
7.(a)	State and explain Biot-Savart's Law.	7
(b)	Find H at (-3, 4, 0) due to the current filament shown in figure.	



8	Write short notes on **any two** of the following (a) Poynting Vector (b) Sky wave propagation (c) Super refractive or Duct Propagation (d) Ground wave propagation	2.5X2

PHYSIAL CONSTANTS

i	Permeability of free space(μ_0) = 4π X 10^{-7} H/m
ii	Permittivity of free space(ε_0) = $8.854X10^{-12}$ F/m
iii	Velocity of light in free space (V_0) = $2.998X10^8$ m/s
iv	Intrinsic impedance (η_0) = 120π or 377Ω
v	1 N_p = 8.686 dB

All the Best!

Department of Electronics & Communication Engineering

NATIONAL INSTITUTE OF TECHNOLOGY, ROURKELA

END-SEMESTER EXAMINATION, Spring 2012

CLASS: B.Tech (6th Sem), EC & EI — TIME: 3hours

SUBJECT: **ELECTRONIC INSTRUMENTATION** — F.M:50

SUBJECT CODE: **EC332**

*Answer any **five** question including **Q.1***

Figures in the right hand margin indicate marks

All parts of a question should be answered in one place

This question paper contains 3 pages

Q No.			Marks
1	a	Why permanent magnet moving coil (PMMC) type instrument cannot measure a.c.?	1
	b	What are the advantages and disadvantages of PMMC type instruments.	2
	c	What is a transfer instrument? Explain why electrodynamometer type of instruments can be used both a.c. and d.c.?	2
	d	What will be the reading when a voltage $e = 200\sin(wt) + 40\sin(3wt + 30^0) + 30\cos(5wt + 21.5^0)$ is applied to an electrodynamometer voltmeter?	1
	e	What are the differences between accuracy and precision?	2
	f	Describe briefly the electron gun assembly in CRT.	2
2	a	Explain about the permanent magnet moving coil type instrument and its the torque equation.	6
	b	A moving coil voltmeter with a resistance of 20Ω gives a full scale deflection of 120° when a potential difference of 100mV is applied across it. The moving coil has dimension of 30mm×25mm and is wound with 100 turns. The control spring constant is 0.375×10^{-6} Nm/deg. Find the flux density in the air gap. Find also the diameter of copper wire of coil winding if 30 percent of instrument resistance is due to coil winding. The specific resistance for copper=1.7×10^{-8} Ωm.	3
	c	The coil of an instrument has 38 turns. The mean width and axial length of the coil are 25mm and 20mm respectively. If flux density is 0.12Wb/m^2, calculate the torque on the	

moving coil for a current of 12mA through the coil.

3	a	Describe the constructional and working details of an electrodynamometer type of instrument. Derive the equation for deflection under a.c. operation if the meter is spring controlled. Discuss the shape of the scale.	6
	b	Explain how the range of electrodynamometer type voltmeter and ammeter can be increased?	2
	c	A dynamometer is fitted with two fixed coils having a total resistance of 3Ω and a total inductance of 0.12H, and a moving coil of resistance 30 Ω and an inductance of 0.003H. Calculate the error in reading when the instrument is calibrated with d.c. and used on a.c. 50 Hz with moving coil shunted directly across the field coils.	2
4	a	Show that the movement of the electrons under electrostatic deflection, in CRT, is parabolic.	4
	b	Explain the functioning of time base generator in CRO.	2
	c	Explain the procedure for measurement of frequency by CRO using Lissajous patterns.	2
	d	The deflection sensitivity of a CRO is 35V/cm. If the distance from the deflection plates to the screen is 16cm, the length of the deflection plates is 2.5cm and the distance between the deflection plates is 1.2cm. What is the acceleration anode voltage?	4
	e	Describe the phenomenon of synchronization of vertical input signal to its sweep generator	2
5	a	Describe the construction and working of a ballistic galvanometer. Explain the difference in constructional details of ballistic and d'Arsenoval galvanometer.	8
	b	A ballistic galvanometer has a resistance of 150 Ω and an undamped period of 7.5s. A steady emf of 3.5mV produces a deflection of 210mm. Determine the quantity of electricity discharged from a capacitor if the deflection produced is 750mm. The relative damping is 0.8.	6
	c	Describe the methods used for calibration of a ballistic galvanometer.	4

a The following measurements were made on a panel type PMMC instrument which has a full scale deflection 90^0=100 scale divisions, with a current of 1mA. The period of free oscillation is 0.55s. In order to measure the spring constant a small weight having gravitational force of 98.1×10^{-6}N is placed at a distance of 100mm from the horizontal axis of rotation with the horizontal pointer acting as level arm; the resulting deflection being 35 divisions. The first maximum deflection is 106 divisions when a current of 1mA is suddenly passed through the meter. The value of flux density in the air gap measured with a Hall probe is 0.24Wb/m^2. The length of the coil is 15mm and the average diameter of the coil is 14mm. From the above data calculate (i)Spring constant(ii)Moment of inertia (iii)Number of turns (iv)Damping ratio (v)Damping constant (vi)Equivalent resistance of the short circuited winding represented by the damping action of the former of the coil.

b Explain the construction and working principle of moving iron instruments. Describe about the classification of moving iron instruments.

c A moving iron instrument has full scale current of 100 mA. It is converted into a 250V voltmeter by using a series resistance made of a material having negligible resistance temperature coefficient. The meter has a resistance of 320 Ω at 20° C. After carrying a steady current of 100mA for a long time, the resistance of the coil increases to 369 Ω due to self heating. Calculate the error due to self heating when a voltage of (i) 250V (ii) 125V is applied continuously.

NATIONAL INSTITUTE OF TECHNOLOGY, ROURKELA – 769 008
Department of Electronics & Communications Engineering
B.Tech, End Semester Examination 2011-2012

Subject: *Embedded Systems* Subject ID: EC-322

Max Marks: 50 (*Excess of marks will be rounded up to max marks*) Time: 3 Hrs

Figures in right margin indicate marks. This question paper contains two pages.

Answer all questions

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1. a) Explain the RS232 (DB9) standard. How is 8051 connected to RS232 on a PCB?[4

   b) If in a design it is desired to transfer a letter "B" continuously at 4800 baud rate then program the 8051 accordingly to do this. [4

2. a) Assuming the 11.0592MHz crystal connected to 8051 find (a) the frequency of the square wave generated on pin P1.0 in the following program and (b) the smallest frequency achievable in this program and TH value to do that.

```
        MOV TMOD, #20H
        MOV TH1, #5
        SETB TR1
BACK    JNB TF1, BACK
        CPL P1.0
        CLR TF1
        SJMP BACK
```

   b) Assuming that the clock pulses are fed into pin T1 of 8051, write a program for counter 1 in mode 2 to count the pulses and display the state of the TL1 count on P2. [4

3. a) What are the interrupts in 8051? Show the process of enabling an interrupt. [4

b) Assuming the 11.0592MHz crystal connected to 8051, write a program in which the 8051 gets data from P1 and sends it to P2 continuously while incoming data from the serial port is sent to p0. Set the baud rate at 9600. [4

4. a) Explain the hierarchy of memory with reference to the speed, capacity and cost per bit. [3

b) For ROM chip with 128Kbits capacity, find the number of data and address pins? [2

c) Show the design of an 8031-based system with 8K bytes of program ROM and 8K bytes of data ROM. [3

5. a) Using 7-bit addressing scheme describe a complete data transfer in inter IC bus protocol. [3

b) What are the conditions for the generation of a no acknowledgement signal in I^2C bus [3

c) What is [illegible] phenomenon in I^2C bus? [2

6. a) What is a real time operating system? [2

b) Explain the characteristics of a thread. [2

c) What are the mechanisms of assigning task priorities (scheduling) so that the system works with no conflict in real time? [4

7. a) Describe the basic model of a custom single purpose processor with its constituents and their interactions. [3

b) Draw the block diagram of a FPGA by showing its essential constituents. Explain all the steps in its design flow. [5

All the Best!