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06MAT31

Third Semester B.E. Degree Examination, January 2013
Engineering Mathematics – III

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

PART – A

1 a. Obtain the fourier expansion of $f(x) = \begin{cases} -\pi, & -\pi < x < 0 \\ x, & 0 < x < \pi \end{cases}$ and hence $\sum \frac{1}{(2n-1)^2} = \frac{\pi^2}{8}$ **(07 Marks)**

b. Find the half range cosine series of $f(x) = \begin{cases} \frac{1}{4} - x, & \text{in } 0 < x < \frac{1}{2} \\ x - \frac{3}{4}, & \text{in } \frac{1}{2} < x < 1 \end{cases}$ **(06 Marks)**

c. Obtain the constant term, first coefficients of cosine and sine terms in the fourier series expansion of the function given by the following table:

x	0	1	2	3	4	5
y	9	18	24	28	26	20

(07 Marks)

2 a. Find the fourier transform of $f(x) = \begin{cases} 1-|x|, & \text{for } |x| \le 1 \\ 0, & \text{for } |x| > 1 \end{cases}$

Hence deduce that $\int_0^\infty \frac{\sin^2 t}{t^2}\, dt = \frac{\pi}{2}$ **(07 Marks)**

b. Find f(x), if $\tau_s\{f(x)\} = \frac{s}{s^2+1}$, (fourier sine transform). **(07 Marks)**

c. Find finite fourier cosine transform of $\left(1 - \frac{x}{\pi}\right)^2$ in $0 < x < \pi$. **(06 Marks)**

3 a. Find the partial differential equation representing all planes that are at a perpendicular distance 'p' from the origin. **(07 Marks)**

b. Solve $\frac{\partial^2 z}{\partial x \partial y} = \sin x \sin y$, for which $\frac{\partial z}{\partial y} = -2 \sin y$ when x = 0 and z = 0, if y is an odd multiple of $\pi/2$. **(07 Marks)**

c. Solve $y^2 p - xyq = x(z - 2y)$ **(06 Marks)**

4 a. Derive arc dimensional wave equation. **(07 Marks)**

b. Solve $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$, subject to the conditions u(0, y) = 0, u(π, y) = 0, u(x, ∞) = 0 and u(x, 0) = k sin2x **(07 Marks)**

4 c. Obtain the solution of the heat equation $\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$ subject to the conditions u(0, t) = 0, u(l, t) = 0 and u(x, 0) = f(x). **(06 Marks)**

PART – B

5 a. Using the Regula-Falsi method, find the real root of the equation $xe^x - \cos x = 0$ correct to 4 places of decimals. **(07 Marks)**

b. Solve the system of equations by Gauss-Jordan method :

$x_1 + x_2 + x_3 + x_4 = 2$, $2x_1 - x_2 + 2x_3 - x_4 = -5$,
$3x_1 + 2x_2 + 3x_3 + 4x_4 = 7$, and $x_1 - 2x_2 - 3x_3 + 2x_4 = 5$. **(07 Marks)**

c. Use the power method to find the dominant eigen value and the corresponding eigen vector correct to 2 places of decimals of the matrix

$$\begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$$ by taking initial vector as $[1\ 1\ 1]^T$. **(06 Marks)**

6 a. Find y when x = 0.26 using appropriate interpolation formula to the following data:

x :	0.10	0.15	0.20	0.25	0.30
Y:	0.1003	0.1511	0.2027	0.2553	0.3093

(06 Marks)

b. Fit an interpolating polynomial to the following data using Newton divided difference formula. **(07 Marks)**

x	0	1	4	8	10
f(x)	-5	-14	-125	-21	355

c. Evaluate $\int_4^{5.2} \log_e x \, dx$, using Weddle's rule by taking 7 ordinates. Hence compare with exact value. **(07 Marks)**

7 a. Obtain the Euler's equation for a variational problem in the form

$$\frac{\partial f}{\partial y} - \frac{d}{dx}\left(\frac{\partial f}{\partial y'}\right) = 0$$

Modify this equation when f is independent of y. **(07 Marks)**

b. Show that the equation of the curve joining the points (1, 0) and (2, 1) for which $\int_1^2 \frac{\sqrt{1+y'^2}}{x} dx$ is an extremum is a circle. **(07 Marks)**

c. Prove that the shortest distance between two points in a plane is along the straight line joining them. **(06 Marks)**

8 a. Find the z-transform of the following:

i) $n \cos n\theta$ ii) $n \sin n\theta$ **(06 Marks)**

b. Find inverse z-transforms of the following:

i) $z \log\left(\frac{z}{z+1}\right)$ ii) $\frac{z(2z+3)}{(z+2)(z-4)}$ **(07 Marks)**

c. Solve by using Z-transform, $u_{n+2} - 4u_n = n - 1$ with $u_o = 1$ and $u_1 = 2$. **(07 Marks)**

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06ES33

Third Semester B.E. Degree Examination, January 2013

Logic Design

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

PART – A

1 a. Design a minimum two level gate combinational network that detects the presence of six illegal code group (decimal 10 to 15) in a 4 bit that represent BCD code by providing a logic 0 and lighting a red LED. **(08 Marks)**

b. Simplify the following expressions using Karnaugh map. Implement the simplified circuit using the gates as indicated.

i) $f(w, x, y, z) = \sum m(1, 5, 7, 9, 10, 13, 15) + d(8, 11, 14)$ using NAND gates.

ii) $f(A, B, C, D) = \pi m(0, 1, 2, 4, 5, 6, 8, 9, 12, 13, 14)$ using NOR gates. **(12 Marks)**

2 a. Simplify using Quine McCluskey minimization technique

$Y(A, B, C, D) = \sum m(0, 1, 2, 3, 6, 7, 8, 9, 14, 15)$ **(12 Marks)**

b. Simplify the following Boolean function using variable entered map technique of taking z as the map entered variable:

$f(w, x, y, z) = \sum m(3, 5, 6, 7, 8, 9, 10) + dc(4, 11, 12, 14, 15)$ **(08 Marks)**

3 a. Design a 4 to 16 decoder using 2 to 4 decoders with active low enable and active low outputs. **(08 Marks)**

b. Design a keypad interface to a digital system using ten line to four line encoder. **(06 Marks)**

c. Design a binary full subtractor using basic gates. **(06 Marks)**

4 a. Implement the expression $s = ad + b\bar{c} + bd$ using 4:1 mux. Choose b and d as select lines. **(10 Marks)**

b. Design a combinational circuit that accepts two unsigned 2-bit binary number and provides 3 outputs.

Input : word $A = A_1A_0$ word $B = B_1B_0$

Output : $A = B$, $A > B$, $A < B$. **(10 Marks)**

PART – B

5 a. Explain the working of Master-Slave JK flip-flop with functional table and timing diagram. Show how race around condition is overcome. **(08 Marks)**

b. Explain switch debouncing and its elimination using SR latch. **(06 Marks)**

c. Obtain characteristic equations of JK and SR flip-flops. **(06 Marks)**

6 a. Explain the operation of Ring counter and twisted ring counter using shift register with the help of diagram. **(08 Marks)**

b. Design a synchronous mod 6 counter using clocked JK flip-flop. (sequence 0, 2, 3, 6, 5, 1, 0) **(12 Marks)**

7 a. With block diagram, write the two distinct models used in designing synchronous sequential logic circuit. **(06 Marks)**

b. Give output function, excitation table, transition table, state table and state diagram by analyzing the sequential circuit shown in Fig.Q7(b). **(14 Marks)**

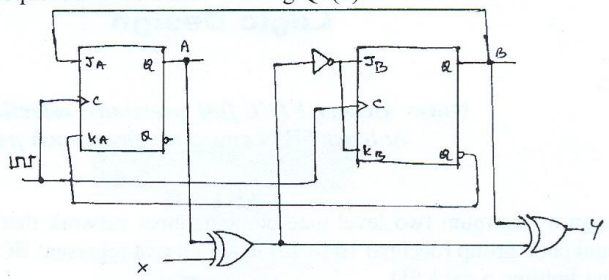

Fig.Q7(b)

8 a. Construct a mealy state diagram that will detect a serial sequence of 10110 when the input poltroon has been detected cause an output z to be asserted high. **(08 Marks)**

b. Design a clocked sequential circuit that operates according to the state diagram shown IN Fig.Q8(b). Implement the circuit using T flip-flop. **(12 Marks)**

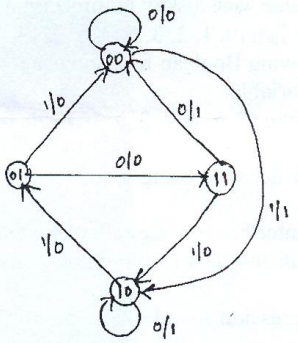

Fig.Q8(b)

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06ES34

Third Semester B.E. Degree Examination, January 2013
Network Analysis

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

PART – A

1 a. Find the equivalent voltage source across AB in network shown in Fig.Q.1(a) using source transformation. **(07 Marks)**

b. Compute the power delivered to the 4Ω resistor in Fig.Q.1(b) using loop current analysis. **(07 Marks)**

c. Find V_{CD} in Fig.Q.1(c) using nodal technique. **(06 Marks)**

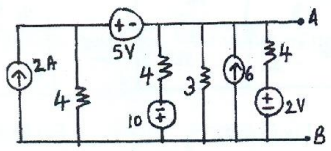

Fig.Q.1(a)

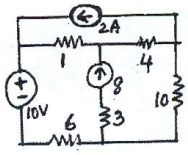

Fig.Q.1(b)

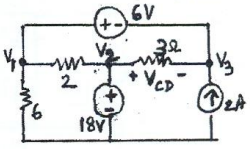

Fig.Q.1(c)

2 a. For the network shown in Fig.Q.2(a), draw a graph, an oriented graph, a tree, a connected graph and an unconnected graph. **(04 Marks)**

b. Obtain the dual of the circuit shown in Fig.Q.2(b) verify the results by formulating equilibrium equations. **(05 Marks)**

c. Formulate the tie-set matrix for the network shown in Fig.Q.2(c). Use 1, 2, 3 as tree branches and hence list the resulting f-loops. **(06 Marks)**

d. Develop the fundamental cut-set matrix for the network shown in Fig.Q.2(d). Use 1, 3, 4 as tree branches. **(05 Marks)**

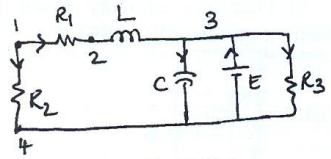

Fig.Q.2(a)

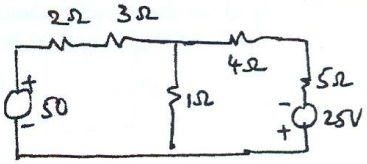

Fig.Q.2(b)

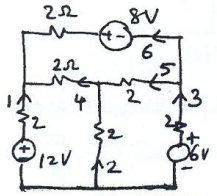

Fig.Q.2(c)

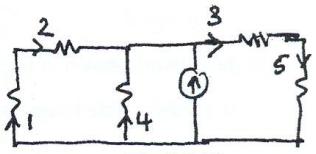

Fig.Q.2(d)

3 a. Using superposition theorem find the voltage 'V' across 3Ω in Fig.Q.3(a). **(09 Marks)**

b. State and explain reciprocity theorem. **(05 Marks)**

c. State and prove Millman's theorem for current sources in series. **(06 Marks)**

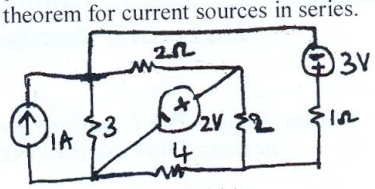

Fig.Q.3(a)

4 a. Applying Theremin's theorem find current in 2_L in Fig.Q.4(a). **(06 Marks)**

b. Find I_L in Fig.Q.4(b) using Norton's theorem. **(07 Marks)**

c. What is the value of R_L for maximum power transfer in Fig.Q.4(c)? Also find the maximum power. **(07 Marks)**

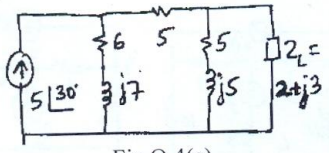

Fig.Q.4(a)

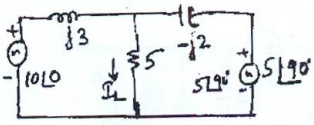

Fig.Q.4(b)

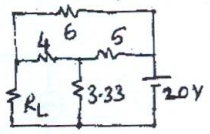

Fig.Q.4(c)

PART – B

5 a. A series RLC circuit has a bandwidth of 600Hz and quality factor of 10. If the value of L is 0.05H, find the value of C. **(04 Marks)**

b. For a two branch RL-RC parallel resonant circuit, determine the expression for resonant frequency. In this circuit for L = 0.4H and C = 40μF, obtain resonant frequency for the following values of R_L and R_C i) $R_L = R_C = 80\Omega$; ii) $R_L = 100$ and $R_C = 80$. **(08 Marks)**

c. Find band width of the antiresonant circuit shown in Fig.Q.5(c), with following conditions i) Q of the inductive branch = 100; ii) Frequency of unity power factor = 1MHz; iii) L = 100 μH and iv) Internal resistance of generator $R_g = 10\Omega$. **(08 Marks)**

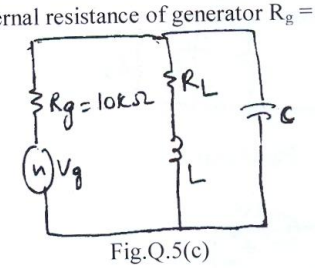

Fig.Q.5(c)

6 a. In the network shown in Fig.Q.6(a), the switch K is changed from position 1 to position 2 at t = 0, steady – state being established at position 1. Find : i, $\frac{di}{dt}$, $\frac{d^2i}{dt^2}$ at t = 0+. **(08 Marks)**

b. The switch K is closed at t = 0 in Fig.Q.6(b). At t = 0- all capacitor voltages and inductor currents are zero. Three node to datum voltages are identified as V_1, V_2 and V_3. Find V_1, V_2, V_3, $\frac{dv_1}{dt}$, $\frac{dv_2}{dt}$, $\frac{dv_3}{dt}$ and $\frac{d^2v_3}{dt^2}$ at $t = 0+$. **(12 Marks)**

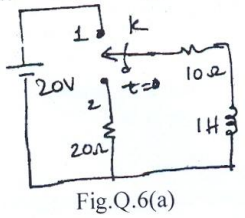

Fig.Q.6(a)

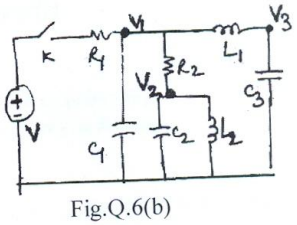

Fig.Q.6(b)

7 a. Find the Laplace transform of x(t) shown in Fig.Q.7(a). **(06 Marks)**

b. In Fig.Q.7(b), switch K is opened at t = 0, steady-state reached at t = 0. Using Laplace transform, find $I_L(s)$ and hence $i_L(t)$. Also find the value of $i_L(t)$ at t = 0.5 seconds. **(10 Marks)**

c. Find the initial and final values of f(t) when $F(s) = \frac{9s+10}{S(s+2)}$. **(04 Marks)**

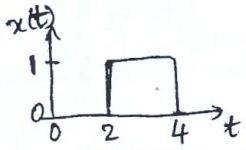

Fig.Q.7(a)

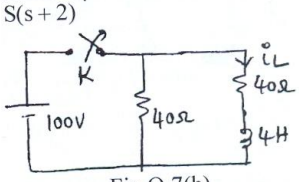

Fig.Q.7(b)

8 a. Compute V_1 and V_2 in Fig.Q.8(a) with admittance matrix $[y] = \begin{bmatrix} 0.3 & -0.1 \\ -0.1 & 0.15 \end{bmatrix}$. **(08 Marks)**

b. Obtain the open-circuit impedance parameters for the network shown in Fig.Q.8(b). **(08 Marks)**

c. Obtain T-parameters in terms of z-parameters. **(04 Marks)**

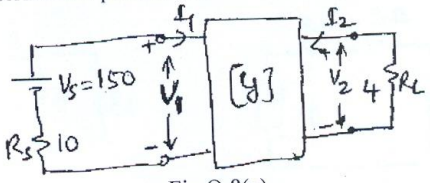

Fig.Q.8(a)

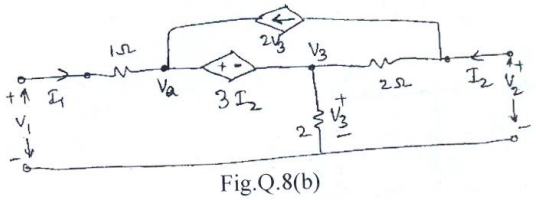

Fig.Q.8(b)

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06IT35

Third Semester B.E. Degree Examination, January 2013
Electronic Instrumentation

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

PART – A

1 a. Define the terms accuracy, error, precision, resolution, expected value and sensitivity. Mention and define the three major categories of error. **(08 Marks)**

b. Calculate the value of multiplier resistance for the multiple range dc voltmeter circuit shown in Fig.Q1(b). **(05 Marks)**

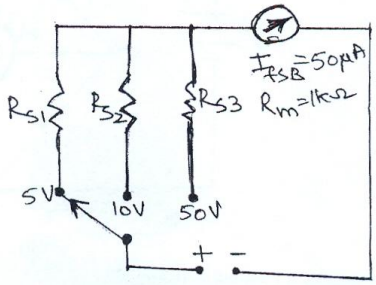

Fig.Q1(b)

c. Compare a true rms meter with an average responding meter, along with diagrams. **(07 Marks)**

2 a. Explain with the help of a neat circuit diagram the working of a dual slope DVM. **(08 Marks)**

b. A 4½ digit voltmeter is used for voltage measurements:
i) Find its resolution
ii) How would 12.98V be displaced on a 10V range?
iii) How would 0.6973 be displayed on 1V and 10V range? **(05 Marks)**

c. Explain with the help of a neat block diagram the working of a DFM (Digital frequency meter). **(07 Marks)**

3 a. Draw the basic block diagram of an oscilloscope and explain the function of each block. **(08 Marks)**

b. What are the advantages of dual trace over dual beam CRO's for multiple trace. **(04 Marks)**

c. What is an electronic switch? Explain its function with the help of neat diagrams in detail. **(08 Marks)**

4 a. Discuss the relationship between sampling rate and pulse waveform rise time along with the diagram. **(04 Marks)**

b. Discuss the need for a time delay system in an oscilloscope. Using illustrations, explain how a delayed time base can improve waveform investigations. **(07 Marks)**

c. Sketch the diagram to show the construction of a bistable storage CRT. Explain its operation. **(06 Marks)**

d. Explain sampling rate and bandwidth. **(03 Marks)**

PART – B

5 a. With the help of a neat block diagram, explain the working of a pulse generator. **(08 Marks)**

b. Draw a block diagram of frequency synthesizer, showing the waveforms at various points. Explain carefully how the synthesizer operates. **(08 Marks)**

c. Draw the block diagram of a function generator and explain the method of producing sine waves. **(04 Marks)**

6 a. An unbalanced Wheatstone bridge is given in Fig.Q6(a). Calculate the current through the galvanometer. **(05 Marks)**

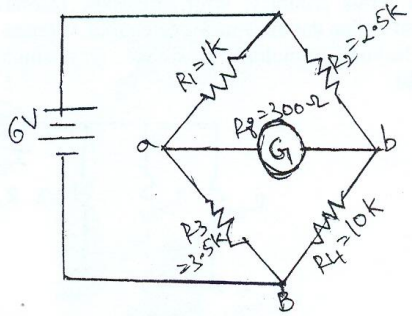

Fig.Q6(a)

b. Describe the operation of a Kelvin's bridge. **(06 Marks)**

c. A capacitance comparison bridge (similar angle bridge) is used to measure a capacitive impedance at a frequency of 2 kHz. The bridge constants at balance are C_3 = 100 μf, R_1 = 10kΩ , R_2 = 50kΩ , R_3 = 100kΩ . Find the equivalent series circuit of the unknown impedance. **(03 Marks)**

d. Explain the operation of Weins bridge along with the derivation for frequency. **(06 Marks)**

7 a. What is a resistive position transducer? Explain its construction with a diagram. **(04 Marks)**

b. An AC LVDT has following data. Input = 6.3V, output = 5.2V, range ±0.5 in. Determine, i) the output voltage vs core position for a core movement going from +0.45 in to –0.30 in. ii) The output voltage, when the core is – 0.25 in. from the centre. **(03 Marks)**

c. Explain the construction and operation of LVDT. **(10 Marks)**

d. Mention the advantages of electrical transducers. **(03 Marks)**

8 a. List various types of temperature transducers & describe the applications of each. **(05 Marks)**

b. Explain in detail about LCD, with diagrams. **(10 Marks)**

c. Explain AC signal conditioning system with general schematic diagram. **(05 Marks)**

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06ES36

Third Semester B.E. Degree Examination, January 2013
Field Theory

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

PART - A

1 a. Define the following : i) Coulomb's law ii) Electric field intensity iii) Gauss law. **(06 Marks)**

b. State the prove divergence theorem. **(06 Marks)**

c. Let $\vec{D} = 5r^2\, a_r$ mc / mt^2 for r < 0.08mt
and $\vec{D} = \frac{0.1}{r^2} a_r$ mc/mt^2 for r > 0.08 mt. Find ρ_v for i) r = 0.06 mt ii) r = 0.1 mt. **(08 Marks)**

2 a. An electric potential is given by $V = \frac{60 \sin\theta}{r^2}$. Find v and $\vec{E}$ at (3, 60^0, 25^0). **(08 Marks)**

b. Derive the integral and point form of continuity equation. **(06 Marks)**

c. Derive the boundary conditions for perfect dielectric materials of permitivities ϵ_1 and ϵ_2. **(06 Marks)**

3 a. Obtain Poisson's and Laplace's equations from Maxwell's first equation. **(06 Marks)**

b. Verify that the potential field given below satisfy Laplace's equation.
$V = 2x^2 - 3y^2 + z^2$. **(06 Marks)**

c. Derive the expression for capacitance of a co – axial cable using Laplace's equation. **(08 Marks)**

4 a. State and explain Biot – Savart law. Using this, find the magnetic flux density at the centre of a circular loop of radius 'a' mt. **(08 Marks)**

b. Magnetic field intensity in free space is $\vec{H} = 10\rho^2\, a_\phi$ A/mt. Determine i) $\vec{J}$ ii) Integrate over the circular surface ρ = 1mt all ϕ and Z = 0. **(06 Marks)**

c. Explain scalar and vector magnetic potentials. **(06 Marks)**

PART - B

5 a. Derive the equation for magnetic force between two differential current elements. **(06 Marks)**

b. Given the ferrite material which is to be operating in a linear mode with $\vec{B}$ = 0.05T and μ_R = 50. Calculate the values for χm, $\vec{M}$ and $\vec{H}$. **(06 Marks)**

c. Define self inductance. Find the same of a Solenoid with air core has 200 turns and a length of 60cm core with radius 3cm. Derive the formula used. **(08 Marks)**

6 a. Derive the Maxwell's equation in point form as derived from Faraday's law. **(06 Marks)**

b. Determine the frequency at which conduction current density and displacement current density are equal in a medium with $\sigma = 2 \times 10^{-4}$ S/mt and $\epsilon_r = 81$. **(06 Marks)**

c. List the Maxwell's equation in differential and integral form as applied to time – varying fields. **(08 Marks)**

7 a. Discuss the uniform plane wave propagation in a good conducting medium. **(06 Marks)**

b. A 9375 MHz uniform plane wave is propagating in polystyrene ($\mu_r = 1$, $\epsilon_r = 2.56$). If the amplitude of electric field intensity is 20V/mt and the material is assumed to be lossless. Find i) Phase constant ii) Wavelength iii) Velocity of propagation iv) Intrinsic impedance v) Magnetic field intensity. **(10 Marks)**

c. State and explain Poynting theorem. **(04 Marks)**

8 a. Define Standing wave ratio (SWR). Find the value of SWR when reflection co-efficient (Γ) $= \pm \frac{1}{2}$. **(04 Marks)**

b. Derive the expressions for transmission co – efficient and reflection co – efficient. **(08 Marks)**

c. Determine the reflection co – efficient and transmission co – efficient for a wave traveling in air and incident on a dielectric medium with $\mu = \mu_0$ and $\epsilon_r = 4$. Also find out average incident, reflected and transmitted powers. Show that average power is conserved. **(08 Marks)**

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