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10MAT31

Third Semester B.E. Degree Examination, December 2012
Engineering Mathematics – III

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Find the Fourier series of $f(x) = x - x^2$, $-\pi \le x \le \pi$. Hence deduce that

$$\frac{1}{1^2}-\frac{1}{2^2}+\frac{1}{3^2}-\dots\dots\dots\dots=\frac{\pi^2}{12}$$

Is the above deduced series convergent? (Answer in Yes or No) **(07 Marks)**

b. Define : i) Half range Fourier sine series of f(x)
ii) Complex form of Fourier series of f(x)
Find the half range cosine series of $f(x) = x$ in $0 < x < 2$. **(07 Marks)**

c. Obtain a_0, a_1, b_1 in the Fourier expansion of y, using harmonic analysis for the data given.

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

(06 Marks)

2 a. Find the Fourier transform of

$$f(x) = 1 - x^2 \quad \text{for} \quad |x| \le 1$$
$$= 0 \quad \text{for} \quad |x| > 1$$

Hence evaluate $\int_0^\infty \frac{x\cos x - \sin x}{x^3}\cos\left(\frac{x}{2}\right)dx$ **(07 Marks)**

b. Find the Fourier sine transform of $\frac{e^{-ax}}{x}$ **(07 Marks)**

c. Find the Fourier cosine transform of

$$f(x) = 4x, \quad \text{for} \quad 0 < x < 1$$
$$= 4 - x, \quad \text{for} \quad 1 < x < 4$$
$$= 0, \quad \text{for} \quad x > 4$$

(06 Marks)

3 a. i) Write down the two dimensional heat flow equation (p d e) in steady state (or two dimensional) Laplace's equation. Just mention.
ii) Solve one dimensional heat equation by the method of separation of variables. **(07 Marks)**

b. Using D'Alembert's method, solve one dimensional wave equation. **(07 Marks)**

c. A string is stretched and fastened to two points l apart. Motion is started by displacing the string in the form of $y = a \sin(\pi x/l)$ from which it is released at time $t = 0$. Show that the displacement of any point at a distance x from one end at time t is,

$$y(x,t) = a\sin\left(\frac{\pi x}{\ell}\right)\cos\left(\frac{\pi ct}{\ell}\right)$$

Start the answer assuming the solution to be

$$y = (C_1\cos(px) + C_2\sin(px))(C_3\cos(cpt) + C_4\sin(cpt))$$

(06 Marks)

4 a. Fit a linear law, $P = mW + C$, using the data

P	12	15	21	25
W	50	70	100	120

(06 Marks)

b. Find the best values of a and b by fitting the law $V = at^b$ using method of least squares for the data,

V (ft/min)	350	400	500	600
t (min)	61	26	7	26

Use base 10 for algorithm for computation. **(07 Marks)**

c. Using simplex method,
Maximize $Z = 5x_1 + 3x_2$
Subject to, $x_1 + x_2 \le 2$; $5x_1 + 2x_2 \le 10$; $3x_1 + 8x_2 \le 12$; $x_1, x_2 \ge 0$. **(07 Marks)**

PART – B

5 a. Use Newton-Raphson method, to find the real root of the equation $3x = (\cos x) + 1$. Take $x_0 = 0.6$. Perform two iterations. **(06 Marks)**

b. Apply Gauss-Seidel iteration method to solve equations

$$20x + y - 2z = 17$$
$$3x + 20y - z = -18$$
$$2x - 3z + 20z = 25$$

Assume initial approximation to be $x = y = z = 0$. Perform three iterations. **(07 Marks)**

c. Using Rayleigh's power method to find the largest eigen value and the corresponding eigen vector of the matrix.

$$A = \begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$$

Take $[1 \ \ 0 \ \ 0]^T$ as the initial approximation. Perform four iterations. **(07 Marks)**

6 a. Use appropriate interpolating formula to compute y(82) and y(98) for the data

x	80	85	90	95	100
y	5026	5674	6362	7088	7854

(07 Marks)

b. i) For the points (x_0, y_0) (x_1, y_1) (x_2, y_2) mention Lagrage's interpolation formula.
ii) If f(1) = 4, f(3) = 32, f(4) = 55, f(6) = 119 ; find interpolating polynomial by Newton's divided difference formula. **(07 Marks)**

c. Evaluate $\int_0^6 \frac{1}{1+x^2} dx$, using

i) Simpson's 1/3rd rule ii) Simpson's 3/8th rule iii) Weddele's rule, using

x	0	1	2	3	4	5	6
$f(x) = \frac{1}{1+x^2}$	1	0.5	0.2	0.4	0.0588	0.0385	0.027

(06 Marks)

7 a. Solve the wave equation $\frac{\partial^2 u}{\partial t^2} = 4\frac{\partial^2 u}{\partial x^2}$ subject to u(0, t), u(4, t) = 0. $u_t(x, 0) = 0$ and u(x, 0) = x(4 - x) by taking h = 1, k = 0.5 upto four steps. **(07 Marks)**

b. Solve two dimensional Laplace equation at the pivotal or nodal points of the mesh shown in Fig.Q7(b). To find the initial values assume u_4 = 0. Perform three iterations including computation of initial values. **(07 Marks)**

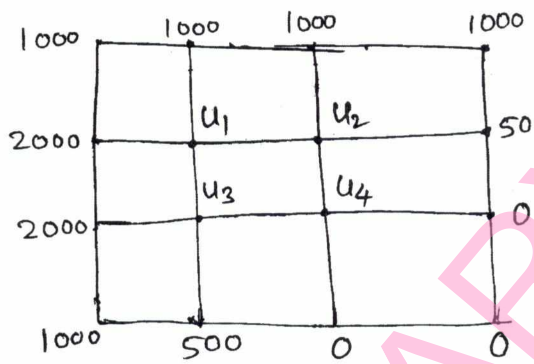

Fig.Q7(b)

c. Solve the equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$, subject to the conditions u(x, o) = sinπx, o ≤ x ≤ 1; u(0, t) = u(1, t) = 0. Carry out computations for two levels, taking h = 1/3 , k = 1/36. **(06 Marks)**

8 a. Find the z-transform of

$$\frac{n}{3^n} + 2^n n^2 + 4\cos(n\theta) + 4^n + 8$$ **(07 Marks)**

b. State and prove i) Initial value theorem ii) Final value theorem of z-transforms. **(07 Marks)**

c. Using the z-transform solve
$u_{n+2} + 4u_{n+1} + 3u_n = 3^n$ with $u_0 = 0$, $u_1 = 1$. **(06 Marks)**

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Third Semester B.E. Degree Examination, December 2012
Analog Electronic Circuits

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Explain reverse recovery time of a semiconductor diode. **(07 Marks)**

b. Explain avalence breakdown and zener breakdown. **(06 Marks)**

c. For the diode circuit shown in Fig.Q.1(c), calculate I_D, V_D and V_R, assume $V_r = 0.7V$. **(07 Marks)**

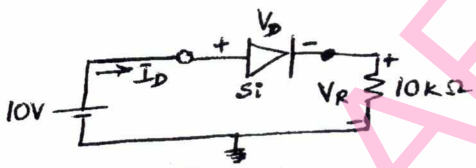

Fig.Q.1(c)

2 a. Explain with a neat diagram, fixed bias configuration to fix the operating point. **(06 Marks)**

b. Derive the expression for stability factors for fixed-bias circuit, with respect to I_{CO}, V_{BE} and β. **(06 Marks)**

c. For the emitter bias circuit shown in Fig.Q.2(c), find the values of R_C, R_E and R_B using the following specifications $I_{C(sat)} = 10$ mA, $I_{CQ} = 1/2\ I_C(sat)$, $V_C = 20V$. Assume silicon transistor with $\beta = 100$. **(08 Marks)**

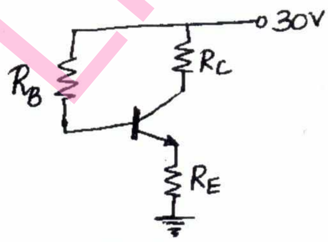

Fig.Q.2(c)

3 a. Obtain the expressions for voltage gain Z_{in} and Z_o of common-base configuration using AC equivalent circuit with re model. **(07 Marks)**

b. Explain with a neat circuit diagram, Emitter follower configuration justify how. Voltage gain is approximated to unity. **(07 Marks)**

c. For the circuit shown in Fig.Q.3(c) determine V_{CC} if $A_V = -160$ and $r_o = 100$ kΩ, take $\beta = 100$. **(06 Marks)**

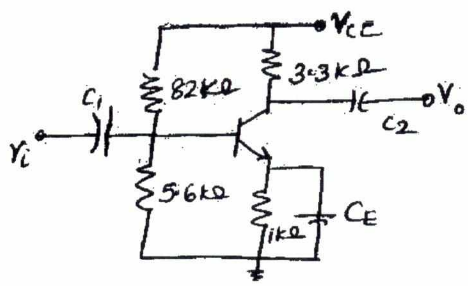

Fig.Q.3(c)

4 a. Describe the factors that affect the low frequency response of a BJT-CE amplifier. **(10 Marks)**
b. For the common-base amplifier shown in Fig.Q.4(b) calculate r_e, R_i, A_v, C_s, C_c, over all lower cut-off frequency $\beta = 75$ and $r_0 = \infty$. **(10 Marks)**

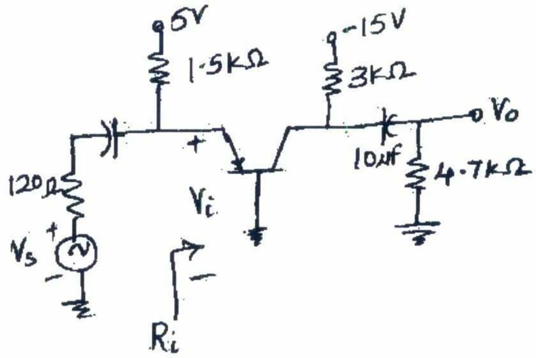

Fig.Q.4(b)

PART – B

5 a. With the help of a neat circuit diagram, explain the working of a Dalington Emitter-Follower and derive Z_i, A_i, A_v and Z_o. **(10 Marks)**
b. List the general characteristics of a negative feedback amplifier and derive the expression for gain with negative feedback. **(10 Marks)**

6 a. Explain the operation of a class B push-pull power amplifier with the help of a neat circuit diagram and also draw the i/p and o/p waveforms of the class B power amplifier, justify elimination of even harmonic distortion. **(10 Marks)**
b. A class B push-pull amplifier operating with $V_{CC} = 25V$ provides a 22V peak signal to an 8Ω load. Find.
Peak load current, dc current drawn from the supply, input power, output power, circuit efficiency, power dissipation. **(10 Marks)**

7 a. Derive the expression for frequency of a Wein Bridge oscillator and explain the operation using a neat circuit diagram. **(08 Marks)**
b. In a transistor Colpitts oscillator C_1 = 1nF and C_2 = 1000nF. Find the value of L for a frequency of 100 kHz. **(06 Marks)**
c. A crystal has the following parameter L = 0.3344, C_M = 1pF, C = 0.065 pF and R = 5.5 KΩ. Calculate the series resonant frequency, parallel resonant frequency and find the Q of the crystal. **(06 Marks)**

8 a. Explain the operation of JFET amplifier using fixed bias configuration. Draw the JFET small signal model and derive expressions for input impedances output impedance and voltage gain A_v. **(10 Marks)**
b. For the JFET amplifier shown in Fig.Q.8(b). Calculate Z_i, Z_o and A_v. **(10 Marks)**

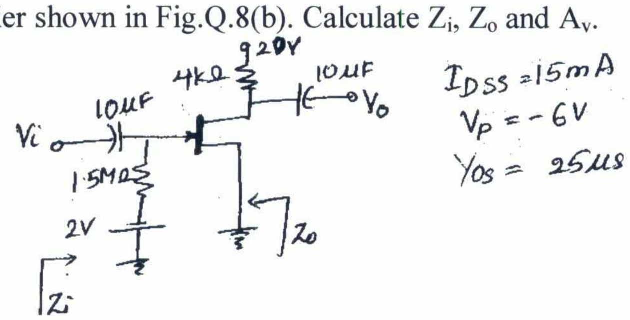

Fig.Q.8(b)

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Third Semester B.E. Degree Examination, December 2012

Logic Design

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Define canonical Minterm form and canonical Maxterm form. **(05 Marks)**

b. Design a three-input, one output minimal two-level gate combinational circuit which has an output equal to 1 when majority of its inputs are at logic 1 and has an output equal to 0 when majority of its inputs are at logic 0. **(05 Marks)**

c. Minimize the following multiple output functions using K-MAP:

$f_1 = \sum m(0, 2, 6, 10, 11, 12, 13) + d(3, 4, 5, 14, 15)$

$f_2 = \sum m(1, 2, 6, 7, 8, 13, 14, 15) + d(3, 5, 12)$ **(10 Marks)**

2 a. Use a K-Map to simplify that following functions:

i) $f(A, B, C, D) = (A + B + \overline{C})(\overline{B} + \overline{D})(\overline{A} + C)(B + C)$

ii) $f(A, B, C, D) = \pi(1, 2, 4, 5, 7, 8, 10, 11, 13, 14)$ **(10 Marks)**

b. Find all the prime implicants of the function

$f(a, b, c, d) = \sum(7, 9, 12, 13, 14, 15) + \sum d(4, 11)$

Using Quine Mc Clusky algorithm. **(10 Marks)**

3 a. Reduce the given function using MEV technique:

i) $f = \overline{A}\,\overline{B}\,\overline{C} + \overline{A}\,\overline{B}\,C\,D + \overline{A}\,B\,\overline{C}\,\overline{D} + A\overline{B}\,\overline{C}\,D + ABCE + ABC\overline{E} + d(A\overline{B}CD + A\overline{B}CE)$

ii) $f = m_0 + m_1F + m_2 + m_4F + m_6(E + \overline{E}) + m_7F + m_{10}E$
$+ m_{12} + m_{15}F + d(m_5F + m_9\overline{F} + m_{11}\overline{E} + m_8E)$ **(10 Marks)**

b. Write the condensed truth table for a 4 to 2 line priority encoder with a valid output where the highest priority is given to the highest bit position or input with highest index and obtain the minimal sum expressions for the outputs. **(06 Marks)**

c. Describe general working principle of decoder. **(04 Marks)**

4 a. Explain the working principle of four-bit parallel fast look ahead carry adder. **(10 Marks)**

b. Design a comparator to check if two n-bit numbers are equal. Configure this using cascaded stages of 1-bit comparators. **(10 Marks)**

PART – B

5 a. With a neat diagram, explain the working of Master-Slave JK flip-flop along with waveforms. **(10 Marks)**

b. Explain switch debouncer using SR latch with waveforms. **(10 Marks)**

6 a. Explain universal shift register with the help of logic diagram, mode control table. **(10 Marks)**

b. Design and implement a divide-by-10 asynchronous counter using T FFS. **(10 Marks)**

7 a. Design and implement a synchronous BCD counter using J-K FFS. **(10 Marks)**

b. A sequential circuit has one input and one output state diagram is as shown in Fig.Q7(b). Design the sequential circuit with J-K flip-flop.

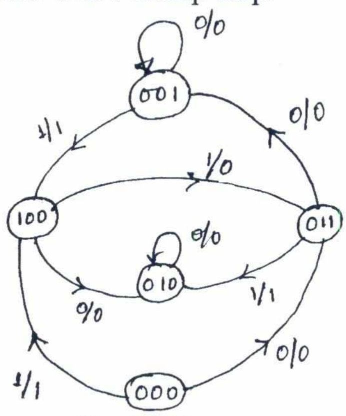

Fig.Q7(b) **(10 Marks)**

8 a. Design a sequence detector for the following sequence 1, 0, 1, 1, 1 with overlap. Write the state diagram and logic diagram. **(10 Marks)**

b. A sequential circuit has two flip-flops A and B, two inputs x and y, and an output z. The flip-flop input functions and the circuit output functions are as follows:

$J_A = x B + \bar{y} \bar{B}$; $K_A = x \bar{y} \bar{B}$

$J_B = x \bar{A}$; $K_B = x \bar{y} + A$

$z = xyA + \bar{x} \bar{y} B$

Obtain the logic diagram, state table and state equations, also state diagram. **(10 Marks)**

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10ES34

Third Semester B.E. Degree Examination, December 2012

Network Analysis

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Define and distinguish the following network elements:
i) Linear and non-linear   ii) Active and passive
iii) Lumped and distributed   iv) Ideal and practical current sources **(08 Marks)**

b. Write the mesh equation for the circuit shown in Fig.Q1(b) and determine mesh currents using mesh account analysis. **(06 Marks)**

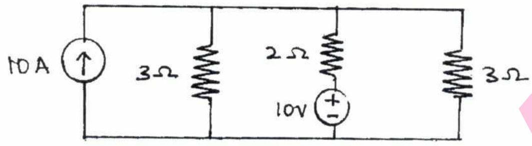

Fig.Q1(b)

c. Reduce the network shown in Fig.Q1(c) to a single voltage source in series with a resistance using source shift and source transformations. **(06 Marks)**

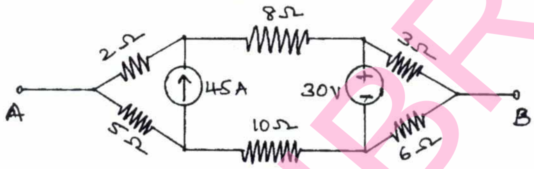

Fig.Q1(c)

2 a. Define the following terms with reference to network topology. Give examples.
i) Tree   ii) Graph   iii) Sub-graph   iv) Tie-set   v) Cut-set **(10 Marks)**

b. Construct a tree for the network shown in Fig.Q2(b) so that all loop currents pass through 7Ω. Write the corresponding the set matrix. **(06 Marks)**

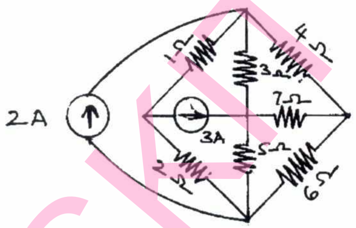

Fig.Q2(b)

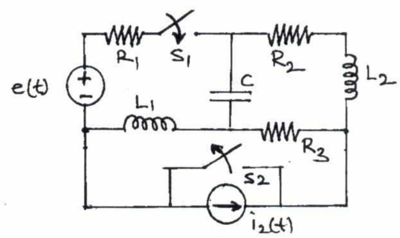

Fig.Q2(c)

c. What are dual networks? Draw the dual of the circuit shown in Fig.Q2(c). **(04 Marks)**

3 a. Using superposition theorem, obtain the response I for the network shown in Fig.Q3(a).

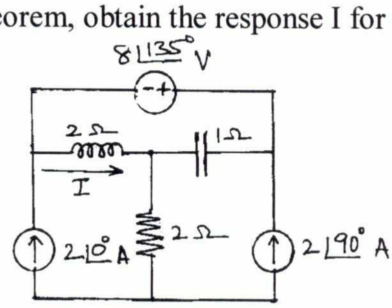

Fig.Q3(a) **(08 Marks)**

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.

6 b. In the network shown in Fig.Q6(b), 'K' is changed from position 'a' to 'b' at t = 0. Solve for i, $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at $t = 0^+$, if R = 1000 Ω, L = 1H and C = 0.1μF and V = 100V. Assume that the capacitor is initially uncharged. **(10 Marks)**

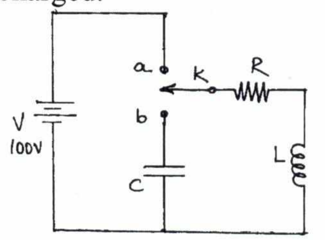

Fig.Q6(b)

7 a. Assuming that the staircase waveform of Fig.Q7(a) is not repeated, find its Laplace transform. If this voltage wave is applied to a RL series circuit with R = 1Ω and L = 1H, find the current i(t). **(10 Marks)**

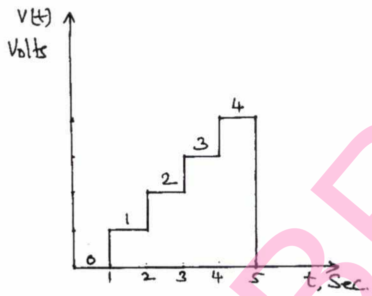

Fig.Q7(a)

b. The network shown in Fig.Q7(b) was in steady state before t = 0. The switch is opened at t = 0. Find i(t) for t > 0, using Laplace transform. **(10 Marks)**

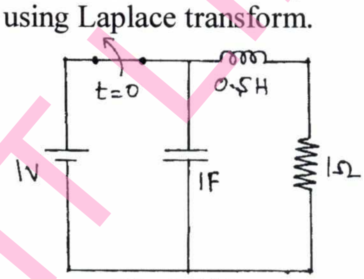

Fig.Q7(b)

8 a. Obtain the h-parameters for the network shown in Fig.Q8(a). **(10 Marks)**

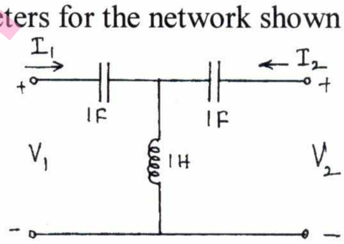

Fig.Q8(a)

b. Obtain ABCD parameters in terms of z-parameters and hence show that AD – BC = 1. **(10 Marks)**

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

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Define 'Electric field intensity'. Derive an expression for electric field intensity' $(\bar{E})$ at a point due to many charges. **(07 Marks)**

b. Point charges of 50 nc each are located at A(1, 0, 0) B(-1, 0, 0) C(0, 10) and D(0, -1, 0)m, find the total force on the charge at A and also find $\vec{E}$ at A. **(05 Marks)**

c. Given $\vec{D} = 5a\vec{r}$ c/m^2, prove divergence theorem for a shell region enclosed by spherical surfaces at r = a and r =b (b > a) and centred at the origin. **(08 Marks)**

2 a. Find the electric field intensity at point x(1, 2, -1) given the potential $V = 3x^2y + 2y^2z + 3xyz$. **(05 Marks)**

b. Derive boundary conditions between conductor and free space if different 'ε'. **(08 Marks)**

c. Show that capacitance of co-axial cable is $C = \dfrac{2\pi \in L}{\ell_n[b/a]}$ F with usual notations. **(07 Marks)**

3 a. With usual representations derive Poisson's equation. **(05 Marks)**

b. Verify that the potential field given below satisfies the Laplace's equation $V = 2x^2 - 3y^2 + z^2$. **(05 Marks)**

c. A large spherical cloud of radius 'b' has a uniform volume charge distribution of ρ_V c/m^3, find the potential distribution and electric field intensity at any point in space using Laplace. **(10 Marks)**

4 a. State and explain Biot – Savart law. **(06 Marks)**

b. Calculate the value of vector current density in cylindrical co –ordinates at p(1.5, 90°, 0.5) if $\vec{H} = \dfrac{2}{\rho}\cos 0.2\phi\ \overrightarrow{a\phi}$. **(06 Marks)**

c. Given $\vec{H} = 20r^2\ \overrightarrow{a\phi}$ A/m, determine the current density J also determine the total current that crosses the surface r = 1 m, $0 < \phi < 2\pi$ and z = 0 in cylindrical co-ordinate. **(08 Marks)**

PART – B

5 a. Derive lorentz force equation. **(05 Marks)**

b. Find the force per meter length between two long parallel wires separated by 10 cm in air and carrying a current of 10A in the same direction. **(05 Marks)**

c. Calculate the inductance of a solenoid of 200 turns wound tightly on a cylindrical tube of 6 cm diameter. The length of the tube is 60 cm, the solenoid is in air. Derive the equation for 'L'. **(10 Marks)**

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.

6 a. Explain Maxwell's equations for time varying fields. **(10 Marks)**

b. Find amplitude of displacement current density (J_D) in the free space within a large power distribution transformer $\vec{H} = 10^6 \cos(377t + 1.2566 \times 10^6 z)\,\vec{ay}$ A/m. **(05 Marks)**

c. Given $H = H_m e^{j(\omega t + \beta z)} \vec{ax}$ A/m in free space find $\vec{E}$. **(05 Marks**

7 a. Starting from Maxwell's equations obtain the general wave equations in electric and magnetic field. **(10 Marks)**

b. A 300 MHz uniform plane wave propagates through fresh water for which $\sigma = 0$, $\mu_r = 1$, $\epsilon_r = 78$, calculate :

i) Attenuation constant
ii) Phase constant
iii) Wave length
iv) Intrinsic impedance. **(05 Marks)**

c. State and explain Poynting theorem. **(05 Marks)**

8 a. Define transmission co-efficient and reflection co-efficient deduce the relationship between them. **(06 Marks)**

b. A traveling $\vec{E}$ field in the free space of amplitude 100 v/m strikes a perfect dielectric as shown in Fig. Q8(b). Determine E_t. **(10 Marks)**

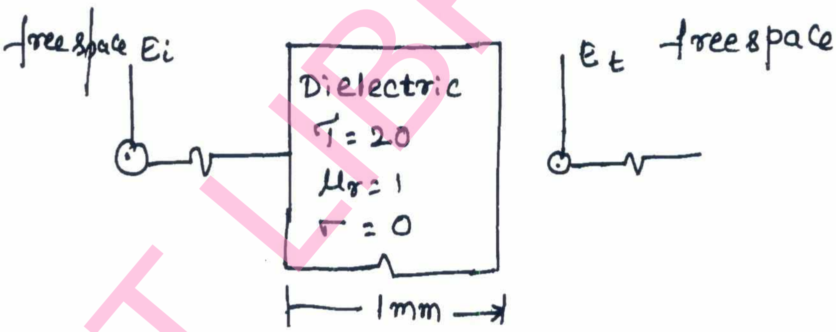

Fig. Q8(b)

c. Write a note on SWR. **(04 Marks)**

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Third Semester B.E. Degree Examination, December 2012

Advanced Mathematics – I

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions.***

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.

1 a. Find the modulus and amplitude of the complex number $1-\cos\alpha + i\sin\alpha$. **(05 Marks)**

b. If z_1 and z_2 are two complex numbers, show that $|z_1+z_2|^2+|z_1-z_2|^2 = 2\{|z_1|^2+|z_2|^2\}$. **(05 Marks)**

c. Find the fourth roots of $-1+i\sqrt{3}$. **(05 Marks)**

d. If $2\cos\theta = x+\frac{1}{x}$, prove that $2\cos r\theta = x^r + \frac{1}{x^r}$. **(05 Marks)**

2 a. Find the n^{th} derivative of $e^{2x}\cos^3 x$. **(07 Marks)**

b. Find the n^{th} derivative of $\frac{x}{x^2-5x+6}$. **(06 Marks)**

c. If $y = e^{a\sin^{-1}x}$, prove that $(1-x^2)y_{n+2}-(2n+1)xy_{n+1}-(n^2+a^2)y_n = 0$. **(07 Marks)**

3 a. Find the angle between the pair of curves $r = 6\cos\theta$, $r = 2(1+\cos\theta)$. **(07 Marks)**

b. Find the pedal equation of the curve $r^2 = a^2\sin 2\theta$. **(06 Marks)**

c. Obtain the Maclaurin's series expansion of the function $\sqrt{1+\sin 2x}$. **(07 Marks)**

4 a. If $u = x^2y + y^2z + z^2x$, prove that $\frac{\partial u}{\partial x}+\frac{\partial u}{\partial y}+\frac{\partial u}{\partial z} = (x+y+z)^2$. **(05 Marks)**

b. If $u = \tan^{-1}\left(\frac{x^3y^3}{x^3+y^3}\right)$, prove that $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y} = \frac{3}{2}\sin 2u$. **(05 Marks)**

c. If $u = x+y+z$, $v = y+z$, $z = uvw$, find Jacobian of x, y, z with respect to u, v, w. **(05 Marks)**

d. If $z = f(x, y)$ and $x = e^u + e^{-v}$ and $y = e^{-u} - e^v$, prove that $\frac{\partial z}{\partial u}-\frac{\partial z}{\partial v} = x\frac{\partial z}{\partial x} - y\frac{\partial z}{\partial y}$. **(05 Marks)**

5 a. Obtain the reduction formula for $\int_0^{\pi/2}\cos^n x\,dx$ and hence evaluate $\int_0^{\pi/2}\cos^6 x\,dx$ and $\int_0^{\pi/2}\cos^9 x\,dx$. **(07 Marks)**

b. Evaluate $\int_0^1\int_{x^2}^{\sqrt{x}} xy(x+y)\,dy\,dx$. **(06 Marks)**

c. Evaluate $\int_0^a\int_0^x\int_0^{x+y} e^{x+y+z}\,dz\,dy\,dx$. **(07 Marks)**

6 a. Define Gamma and Beta functions. Show that $\beta(m,n) = 2\int_0^{\pi/2} \sin^{2m-1}\theta \cos^{2n-1}\theta \, d\theta$. **(07 Marks)**

b. Prove that $\int_0^{\infty} x^2 e^{-x^4} dx \times \int_0^{\infty} e^{-x^4} dx = \frac{\pi}{8\sqrt{2}}$. **(07 Marks)**

c. Evaluate $\int_0^1 (\log x)^6 dx$. **(06 Marks)**

7 a. Solve the equation $\frac{dy}{dx} + x\tan(y - x) = 1$. **(06 Marks)**

b. Solve $x^2 y dx - (x^3 + y^3) dy = 0$. **(07 Marks)**

c. Solve $(e^y + y\cos xy)dx + (xe^y + x\cos xy)dy = 0$. **(07 Marks)**

8 a. Solve the equation $(D^3 + 1)y = 0$, where $D = \frac{d}{dx}$. **(06 Marks)**

b. Solve the equation $(D^2 - 2D + 1)y = xe^x$. **(07 Marks)**

c. Solve $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + y = e^{2x} - \cos^2 x$. **(07 Marks)**

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