S.E. Sem. III (CBSGS), Elex

Sub:- Applied maths-III

QP Code : **4787**

(3 Hours) [Total Marks : 80

[Revised Course]

N.B.: 1) Question No.1 is compulsory.

2) Attempt any three from the remaining questions.

3) Assume suitable data if necessary.

1. (a) Determine the constants a,b,c,d if $f(z) = x^2 + 2axy + by^2 + i(dx^2 + 2cxy + y^2)$ is analytic. 5

(b) Find a cosine series of period 2π to represent $\sin x$ in $0 \le x \le \pi$ 5

(c) Evaluate by using Laplace Transformation $\int_0^\infty e^{-3x} t \cos t \, dt$. 5

(d) A vector field is given by $\overline{F} = (x^2+xy^2)\,i + (y^2 + x^2 y)\,j$. Show that $\overline{F}$ is irrotational and find its scalar potential. Such that $\overline{F} = \nabla\emptyset$. 5

2. (a) Solve by using Laplace Transform 6

$(D^2 + 2D + 5)\,y = e^{-t} \sin t$, when $y(0) = 0$, $y'(0) = 1$.

(b) Find the total work done in moving a particle in the force field 6

$\overline{F} = 3xy\,i - 5z\,j + 10x\,k$ along $x = t^2 + 1$, $y = 2t^2$, $z = t^3$ from t=1 and t=2.

(c) Find the Fourier series of the function $f(x) = e^{-x}$, $0 < x < 2\pi$ and $f(x + 2\pi) = f(x)$. Hence deduce that the value of $\sum_{n=2}^{\infty} \frac{(-1)^n}{n^2+1}$. 8

3 (a) Prove that $J_{1/2}(x) = \sqrt{\frac{2}{\pi x}} \cdot \sin x$ 6

(b) Verify Green's theorem in the plane for $\oint (x^2 - y)\,dx + (2y^2 + x)\,dy$ 6

Around the boundary of region defined by $y = x^2$ and $y = 4$.

(c) Find the Laplace transforms of the following. 8

i) $e^{-t}\int_0^t \frac{\sin u}{u}\,du$ ii) $t\sqrt{1 + \sin t}$

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4 (a) If $f(x) = C_1Q_1(x) + C_2Q_2(x) + C_3Q_3(x)$, where C_1, C_2, C_3 constants and Q_1, Q_2, Q_3 are orthonormal sets on (a,b), show that $\int_a^b [f(x)]^2 dx = c_1^2 + c_2^2 + c_3^2$. 6

(b) If $v = e^x \sin y$, prove that v is a Harmonic function. Also find the corresponding harmonic conjugate function and analytic function. 6

(c) Find inverse Laplace transforms of the following. 8

i) $\frac{s^2}{(s^2+a^2)(s^2+b^2)}$ ii) $\frac{s+2}{s^2-4s+13}$

5 (a) Find the Fourier series if $f(x) = |x|$, $-k < x < k$ 6

Hence deduce that $\sum \frac{1}{(2n-1)^4} = \frac{\pi^4}{96}$.

(b) Define solenoidal vector. Hence prove that $\bar{F} = \frac{\bar{a} \times \bar{r}}{r^n}$ is a solenoidal vector 6

(c) Find the bilinear transformation under which 1, i, -1 from the z-plane are mapped onto 0, 1, ∞ of w-plane .Further show that under this transformation the unit circle in w-plane is mapped onto a straight line in the z-plane .Write the name of this line. 8

6 (a) Using Gauss's Divergence Theorem evaluate $\iint_s \bar{F} \cdot d\bar{s}$ where $\bar{F} = 2x^2yi - y^2j + 4xz^2k$ and s is the region bounded by $y^2 + z^2 = 9$ and $x = 2$ in the first octant. 6

(b) Define bilinear transformation. And prove that in a general, a bilinear transformation maps a circle into a circle. 6

(c) Prove that $\int x J_{2/3}(x^{3/2})\, dx = -\frac{2}{3} x^{-1/2} J_{-1/3}(x^{3/2})$. 8

S.E. (sem-III) (CBSGS) Elex

Sub:- Digital Circuits & Design.

QP Code :4818

(3 Hours) **[Total Marks : 80**

N.B.: (1) Question **No.1** is **compulsory**.
(2) Solve any **three** from remaining **five** questions.
(3) Draw **neat** diagram wherever **necessary**.

1. (a) Explain the current sinking and sourcing when two standard TTL gates are connected. **5**

   (b) Explain glitch problem of ripple counter along with waveform. **5**

   (c) Draw truth table and circuit of JK flip flop using NAND gates. **5**

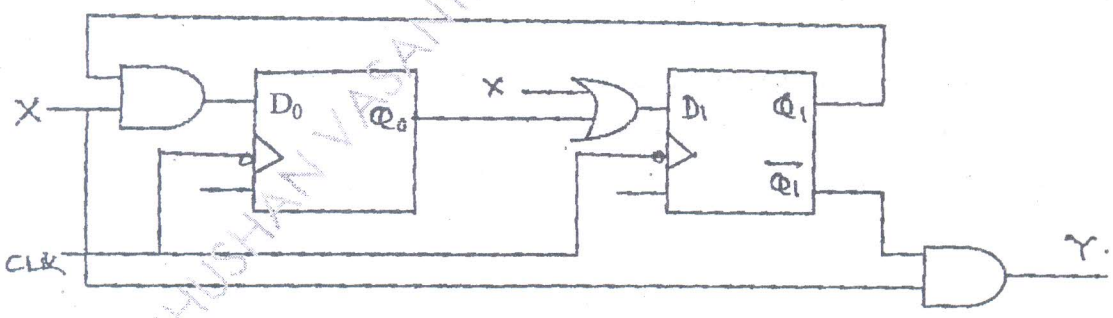
   (d) Draw internal block diagram of IC 7490. **5**

2. (a) Design 4 bit ring counter using IC 74194 and draw Its output waveform. **10**

   (b) Discuss CPLD XC 9500 architecture with neat block diagram. Describe main Features. **10**

3. (a) Design MOD 11synchronous counter using T flip flop. **10**

   (b) Identify the circuit shown in figure. Write the state table and draw state diagram for the same. **10**



4. (a) Implement 10 bit comparator using IC 7485. **10**

   (b) Simplify following logic function and realize using NOR gates. **10**

   $f(w,x,y,z) = \pi M(1, 2, 3, 7, 10, 11) + d(0,15)$

   $f(w,x,y,z) = \pi M(3, 4, 5, 6, 7, 10, 11, 15)$

5. (a) Identify indistinguishable state in following state table and obtain minimized state diagram 10

PS	X = 0		X = 1	
	NS	Output	NS	Output
A	A	0	A	0
B	A	1	F	1
C	D	0	E	0
D	A	1	G	0
E	B	0	C	0
F	D	0	D	0
G	B	0	C	0

(b) Draw a circuit diagram of a CMOS inverter. Draw its transfer Characteristics and explain its operation. 10

6. Write a short note on (any three) ??

(i) K-map.

(ii) Automatic Test Pattern Generation (ATPG) .

(iii) Mealy and Moore sequential machine.

(iv) SR flip flop.

S.E. Sem III CBGS Elex Circuit Theory

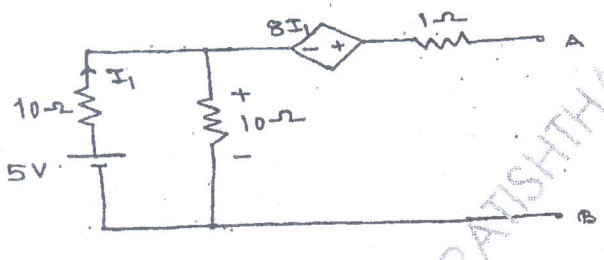
1/6/15

QP Code : **4821**

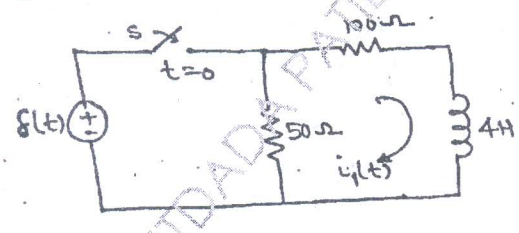
(3 Hours) [Total Marks : 80

N. B. : (1) Question No. **1** is **compulsory**.
(2) Attempt any **three** questions from remaining.
(3) **Figures** to the **right** indicate **full** marks.
(4) Assume suitable data if required.
(5) Use smith chart for transmission line problem.

1. (a) Find the thevnin's equivalent network for terminals A and B. 4



(b) For the network shown, the switch is closed at t = 0. Find the current $i_1(t)$ for $t > 0$ 4

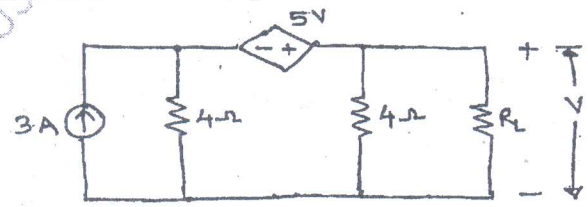


(c) State the condition for reciprocity of h-parameter and prove it. 4

(d) Obtain S-domain equivalent circuit of an inductor and capacitor having non-zero initial conditions. 4

(e) What are scattering parameters. State their properties. 4

2. (a) In the given network, what will be the R_L to get maximum power delivered to it. Calculate power. 8



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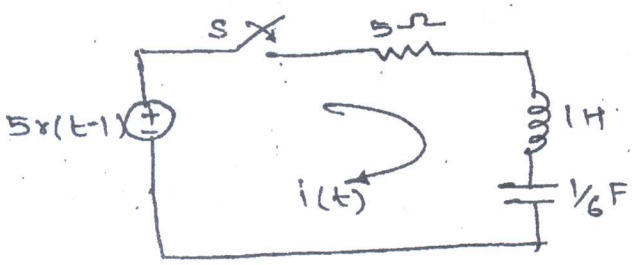
(b) For the network shown, determine the current i(t) when the switch is closed at t = 0 with zero initial conditions. 8



(c) List the types of damping in series R-L-C circuit and mention the condition for each damping. 4

3. (a) Design a single stub match for a load of (150 + j232.5) Ω for 75Ω transmission line at 500 MHz using smith chart. 8

(b) Define T-parameters and relate them to other parameter as indicated. 6

(i) A and C in terms of z-parameters

(ii) B interms of y-parameter

(c) Compare Foster form-I and Foster from-II of an L.C. network. 6

$$Z(s) = \frac{6s(s^2+4)}{(s^2+1)(s^2+64)}$$

4. (a) Check the positive real functions – 8

(i) $F(s) = \frac{s^2+6s+5}{s^2+9s+14}$ and

(ii) $F(s) = \frac{s^3+6s^2+7s+3}{s^2+2s+1}$

(b) Derive an expression for characteristic equation of a transmission line. Also obtain α, β and γ of the line. 8

(c) What are standing waves. Define reflection coefficent and V.S.W.R. of a transmission line. 4

5. (a) Test wheather the following polynomials are Hurwitz, use continuous fraction expansion 10

(i) $s^7 + 2s^6 + 2s^5 + s^4 + 4s^3 + 8s^2 + 8s + 4$

(ii) $s^4 + 2s^2 + 2$

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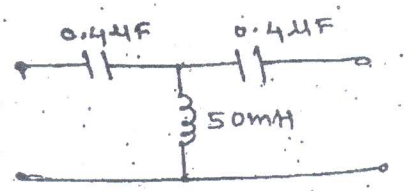
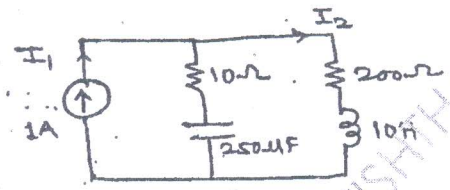
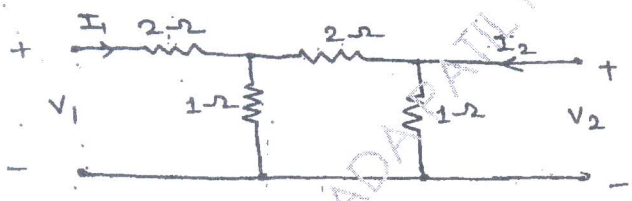
(b) Find the characteristic impedances, cut off frequency and passband frequency for given network. 5



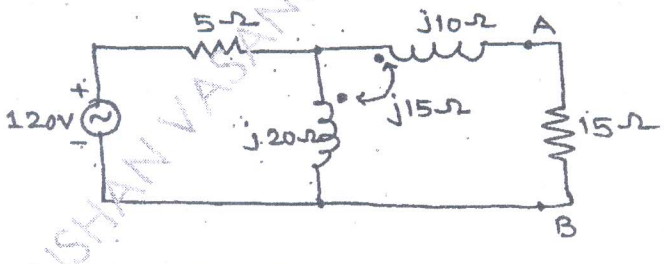
(c) Obtain pole-zero plot for I_2/I_1 5



6. (a) Two identical sections of the network shown are connected in cascade manner. Obtain the transmission line parameters of over all connection. 8



(b) Find the current through 15-Ω resistor 6



(c) Compare Cauer form - I and Cauer form - II of RC Network 6

$$Z(s) = \frac{3(s+2)(s+6)}{s(s+4)}$$

(b) The error response $e(t) = 3.5\ e^{-10t} \sin [60t+60^0]$ for a unit step input. Find natural frequency, damped frequency, damping ratio and comment on the type of damping. 10

4. (a) Plot root locus plot $G(s)\,H(s)=\dfrac{k}{s(s+3)(s^2+3s+20)}$ 12

(b) Find K marginal and frequency of oscillation given 8

$$1+\frac{K}{s(s^2+3s+3)(s^2+16s+18)}=0$$

5. (a) Derive an expression for Bandwidth of a standard second order control system 8

(b) Obtain polar plot Given $G(s)H(s)=\dfrac{45(s+2)}{s^2(s+4)(s+6)}$ 12

Find Wpc and G.M. If '45' is replaced by k then using polar plot find range of k for stability and k marginal.

6. (a) $G(s)H(s)=\dfrac{K}{s(S+8)(s^2+s+1)}$ 8

Determine the value of k that will cause sustained oscillations in the closed Loop system. Also find the frequency of oscillation

(b) Obtain Nyquist plot:- 12

(i) $G(s)H(s)=\dfrac{18}{s(s-4)}$ (ii) $G(s)H(s)=\dfrac{14(s+2)}{s(s-3)}$

Hence comnent on stability and number of pole's on R.H.S of jw axis.

7. Write short notes on the following 20

(a) Synchro transmitters
(b) Static error constants
(c) Stepper motor's
(d) Compensation techniques

RJ-Con. 12194-15.

S.E. Sem-III (OLD) Elex :- ENAS

11/06/2015

(OLD COURSE)

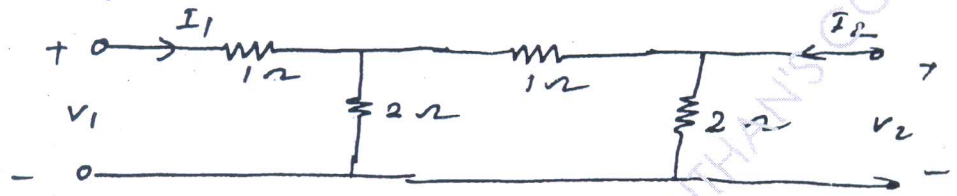
QP Code : 4593

(3 Hours) **[Total Marks : 100**

N. B. : (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** questions from questions **2** to **7**.
(3) **Figures** to the **right** indicate **full** marks.
(4) Assume suitable data whenever required but justify the same.

1. (a) Explain properties of positive real function. **5**

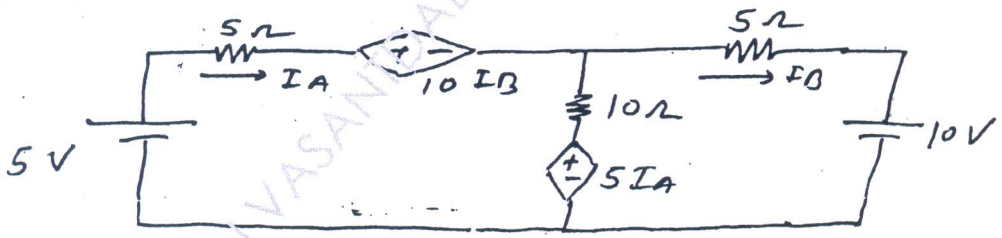
(b) Find Z-parameters for the network shown. **5**



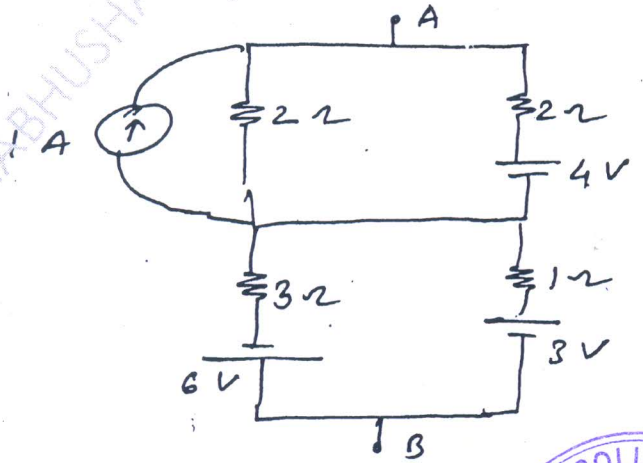
(c) For the given incidence matrix obtain linear graph and total number of trees. **5**

$$A=\begin{vmatrix} 1 & 0 & 0 & 0 & 1 & 1 \\ -1 & 1 & 0 & 1 & 0 & 0 \\ 0 & -1 & 1 & 0 & 0 & -1 \end{vmatrix}$$

(d) For the network shown obtain branch current using mesh analysis. **5**



2. (a) Reduce network shown into single source and single resistor between f **10**



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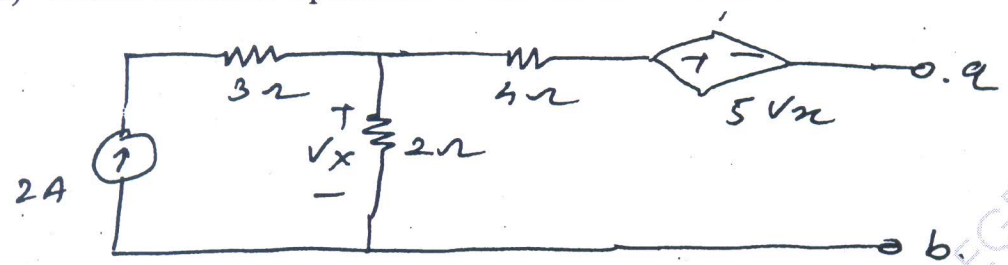
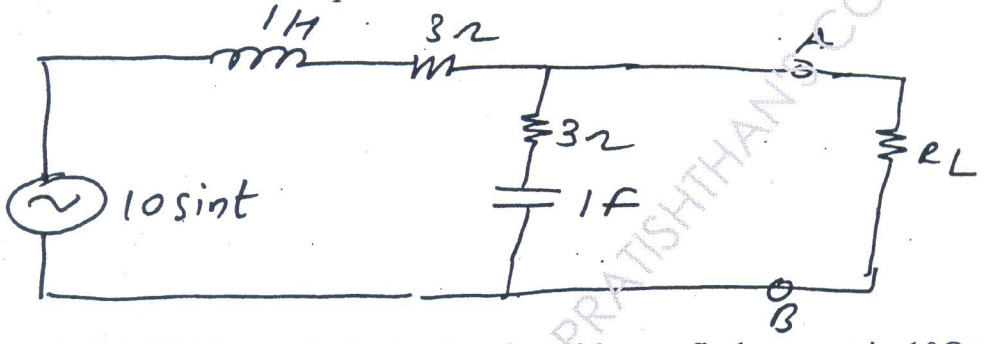
RJ-Con. : 12532-15.

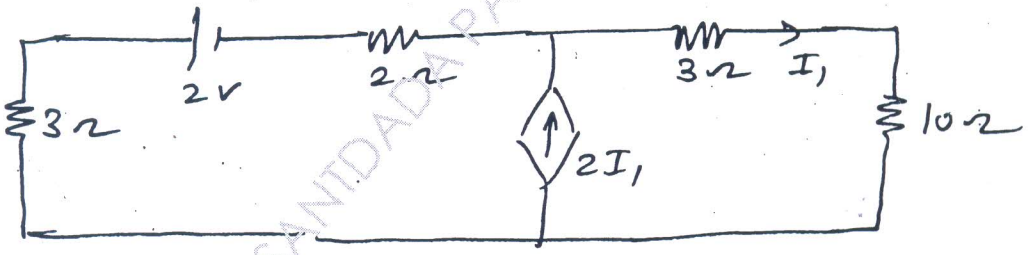
(b) Obtain thevinins equivalent of network shown below. 10



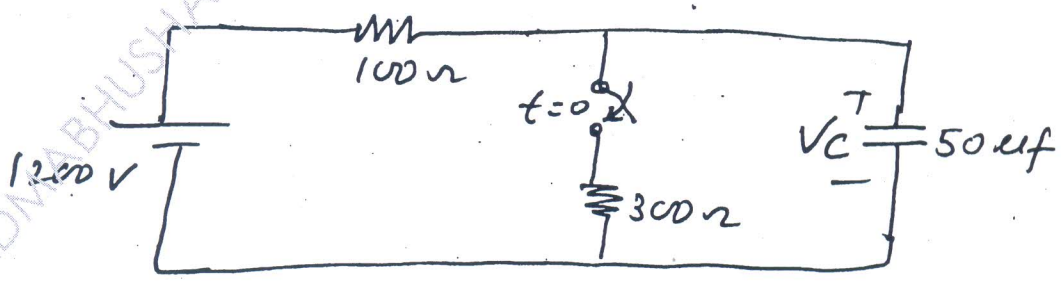
3. (a) Find 'RL' for maximum power. 10



(b) Find NORTON's equivalent network and hence find current in 10Ω resistor. 10



4. (a) For the network shown below, switch is open for a long time and closes of t=0. Determine $V_C(t)$. 10



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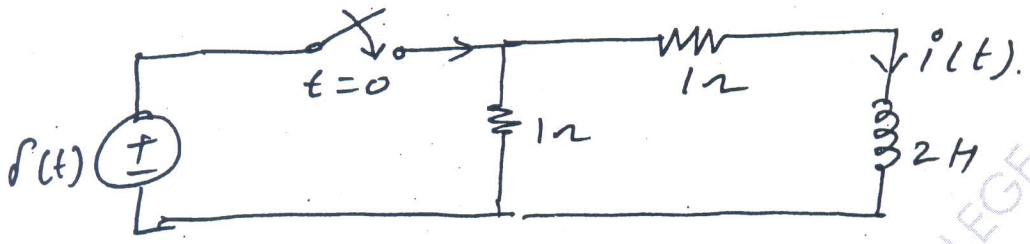
RJ-Con. : 12532-15.

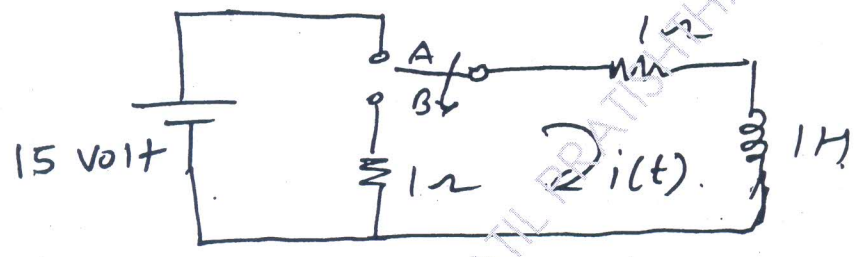
(b) Find Impulse responce of the current i(t) in the network shown below **10**



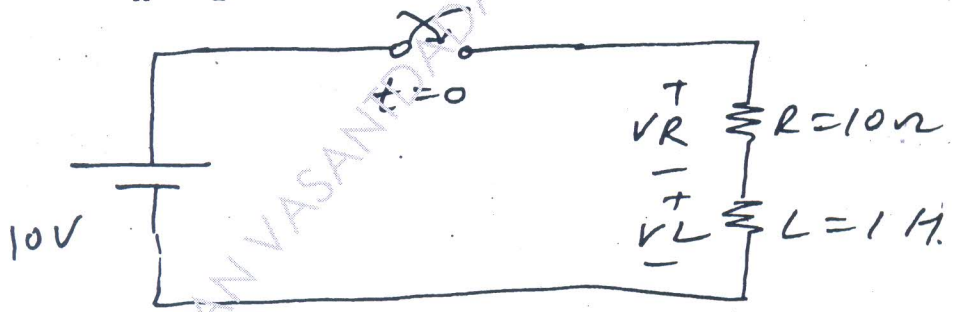
10

5. (a) In the cut shown find $i(0^+)$, $\frac{di}{dt}(0^+)$, $\frac{d_2i}{dt_2}(0^+)$ and i(t) for $t=0^+$. **10**

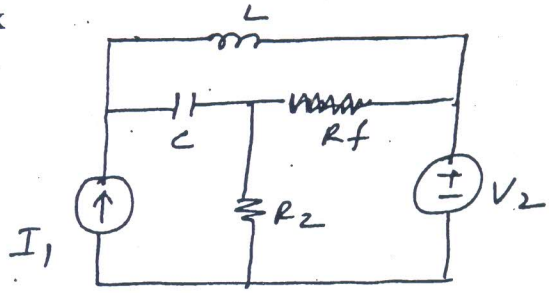
Switch was at position 'A' initially



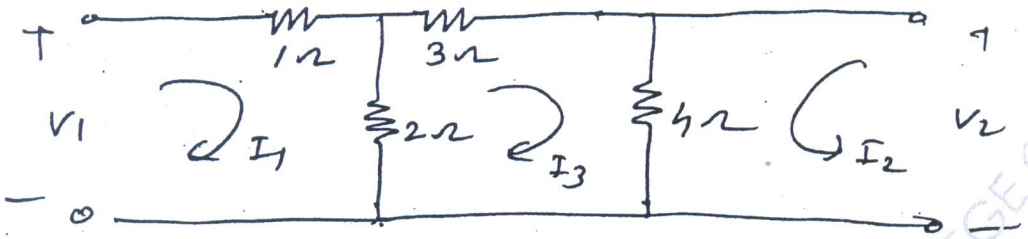
(b) A series RL circuit has constant voltage 'V' applied at t=0. At what time does $V_R = V_L$ **10**



6. (a) For the network shown write **10**
   (i) Incidence matrix
   (ii) Cuffet matrix
   (iii) Tieret matrix



(b) Find ABCD parameter for the circuit shown **10**



7. (a) Test whether **10**

$$F(s)=\frac{s^2+1}{s^3+4s}$$

is positive Real function

(b) Synthesis the following impedance function in the (cauer-I and foster-I from. **10**

$$Z(s)=\frac{s+4}{(s+2)\ (s+6)}$$