SE / E&TRx | III (Rev)
E.M. III 24/11/12
E.M. III

Con. 9242–12. **KR–3077**

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

N.B. : (1) Question No. **1** is **compulsory.**
(2) Attempt any **four** questions out of remaining **six** questions.
(3) Assume any **suitable** data wherever **required.**

1. (a) Prove that $w = \frac{x}{x^2+y^2} - i\frac{y}{x^2+y^2}$ is analytic and find $f'(z)$ in terms of z. 5

(b) Find the Fourier expansion for $f(x) = x$ in $(0, 2\pi)$. 5

(c) Find the Laplace Transform of – 5

$$\sin t \cdot H\left(t-\frac{\pi}{2}\right) - H\left(t-\frac{3\pi}{2}\right)$$

(d) Find Z-Transform of $\{k \cdot e^{-ak}\}$ $k \geq 0$. 5

2. (a) Evaluate $\int_0^\infty \frac{\cos at - \cos bt}{t}\, dt$ 6

(b) Find the Fourier series for $f(x) = 4 - x^2$ in (0,2). Hence deduce that – 7

$$\frac{\pi^2}{6} = \frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \ldots\ldots$$

(c) Find the inverse of A if – 7

$$\begin{bmatrix} 1 & 0 & 0 \\ 2 & -1 & 0 \\ -2 & 1 & 1 \end{bmatrix} A \begin{bmatrix} 1 & -2 & 9 \\ 0 & 1 & -6 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

3. (a) Find Laplace Transform of following – 6

(i) $e^{-t}\int_0^t e^u \cosh u\, du$ (ii) $e^{-3t} \cdot \text{erf}\sqrt{t}$

(b) Find non-singular matrices P and Q such that PAQ is in normal form. Also find rank fo A and A^{-1} if it exist – 7

$$A = \begin{bmatrix} 3 & 2 & -1 & 5 \\ 5 & 1 & 4 & -2 \\ 1 & -4 & 11 & -19 \end{bmatrix}$$

(c) Evaluate by Green's Theorem – 7

$\int_c \bar{F} \cdot d\bar{r}$ where $\bar{F} = -xy(xi - yj)$ and 'C' is $r = a(1 + \cos\theta)$.

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4. (a) Obtain Complex form of Fourier series for the function $f(x) = \text{Sin } ax$ in $(-\pi, \pi)$ where 'a' is not an integer. 6

(b) Investigate for what value of λ and μ the equations. 7

$x + 2y + 3z = 4, \quad x + 3y + 4z = 5, \quad x + 3y + \lambda z = \mu$

have (i) no solution

(ii) a unique solution

(iii) an infinite no. of solutions.

(c) Find inverse Laplace Transform of following :- 7

(i) $2 \tanh^{-1} s$ (ii) $\dfrac{s+29}{(s+4)(s^2+9)}$

5. (a) Prove that $u = \dfrac{1}{2} \log(x^2 + y^2)$ is harmonic. 6

(b) Examine whether the following vectors are Linearly independent or dependent. 7

$X_1 = [1, 1, -1] \quad X_2 = [2, -3, 5] \quad X_3 = [2, -1, 4]$

(c) Express the function – 7

$f(x) = -e^{kx}$, for $x < 0$

$= e^{-kx}$, for $x > 0$

as Fourier integral and prove that –

$$\int_0^\infty \frac{w \text{Sin } wx}{w^2 + k^2} \, dw = \frac{\pi}{2} e^{-kx}, \text{ if } x > 0, \; k > 0$$

6. (a) Obtain half range cosine series for $f(x) = \sin\left(\dfrac{\pi x}{l}\right)$ in $0 < x < l$. 6

(b) Under the tranformation $W = \dfrac{z-1}{z+1}$ show that the map of the straight line $y = x$ is a circle and find its centre and radius. 7

(c) Verify Stoke's Theorem for – 7

$\overline{F} = yzi + zxj + xyk$ and C is the boundary of the circle $x^2+y^2+z^2 = 1$, $z = 0$.

7. (a) Find inverse Z-transform of $F(z) = \dfrac{z}{(z-1)(z-2)}$, $1 < |z| < 2$ 6

(b) Find the analytic function whose real part is $a = \dfrac{\sin 2x}{\cosh 2y - \cos 2x}$. 7

(c) Using Laplace Transform. Solve the following differential equation with given condition 7

$(D^2 - 4)y = 3e^t, \quad y(0) = 0, \quad y'(0) = 3.$

SE-SEM III - (Electronics) Nov-Dec 2012
BEC

D scan Oct.12 391

Con. 7355-12. KR-3170

(3 Hours) [Total Marks : 100

N.B. (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** questions from remaining **six** questions.
(3) **Figures** to the **right** indicate **full** marks.
(4) Assume suitable data wherever **necessary**.

1. Attempt any **four** :–
   (a) Sketch the circuit diagram for a Zener diode voltage regulator. Briefly explain the circuit operation and discuss the effects of load current. 5
   (b) Explain the difference between clipping circuits and clampling circuits. A positive voltage clampling circuit and a positive shunt clipping circuit each have a $\pm$ 12 V square wave input. Sketch the output waveforms for both circuit. 5
   (c) Explain the selection of a Q-point for a transistor bias circuit, and discuss the limitations on the output voltage swing. 5
   (d) Define the following BJT quantities listed on a device data sheet : V_{CBO}, V_{CEO}, V_{EBO} and $V_{CE(sat)}$. 5
   (e) Define forward-transfer admittance, transconductance, output admittance and drain resistance for a JFET. State typical values for each component. 5

2. (a) Using transistor BC 147 A, design single stage CE amplifier to get $A_v \geq 100$ and output voltage V_0 = 3V, $F_L \leq 15$ Hz and $S \leq 10$. 15
   (b) For designed amplifier in (a) above, calculate A_V, R_i and maximum possible undistorted output. 5

3. (a) Using mid-point biasing method, design single stage CS amplifier for $A_v \approx$ II and V_0 = 4·5 V. Use BFW II. V_{GSQ} = 0·3 V, R_L = 120 KΩ, V_{DD} = 20 V. 12
   (b) For the above designed circuit in (a), with source resistor R_S unbypassed determine voltage gain, input impedance, output impedance and output voltage for input voltage of IV_{P-P}. 8

4. (a) A single phase full-wave rectifier use semiconductor diodes. The transformer voltage is 35 V_{rms} to centre tap. The load consists of a 40 μF capacitor in parallel with a 250 Ω resistor. The diode and transformer resistances and leakage reactances may be neglected. Assume that power line frequency is 50 Hz. Calculate – 10
      (i) The dc current I_{dc}
      (ii) Peak to peak amplitude of ripple voltage V_r.
      (iii) The rms value of ripple voltage V_{rms}.
      (iv) Ripple factor of rectifier-filter output.
   (b) Explain input protection methods in MOSFET. 10

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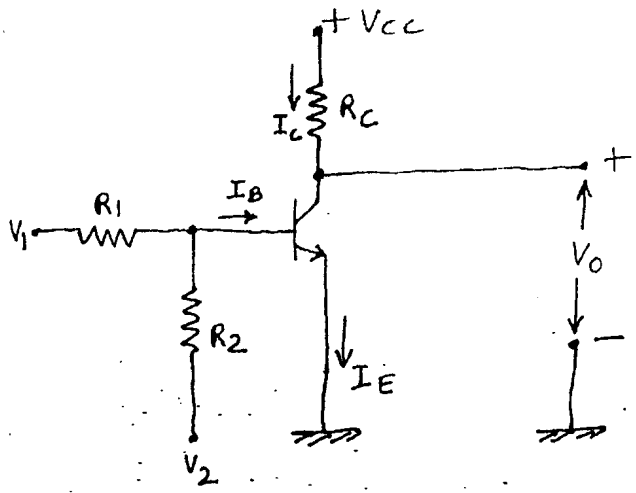
5. (a) 10



If the silicon transistor used in the circuit shown in **Fig 5(a)** has a minimum value of $\beta = h_{FE} = 30$,
Determine,

(i) Whether the transistor is in cut off, active or saturation region for $V_1 = 12$ v, $V_2 = -12$ V, $V_{CC} = 12$ V, $R_1 = 15$ K, $R_2 = 100$ K and $R_C = 2{\cdot}2$ k. Also find V_0.

(ii) Find the minimum value of R_1 for which the transistor in part (i) is in active region. Compute V_0 for $R_1 = 50$ k.

(b) Explain zero temperature drift in JFET. 10

6. (a) Explain various methods of biasing JFET and MOSFET. 15
(b) Explain the concept of thermal runaway in BJT. 5

7. Write short notes on :–
(a) Power MOSFET-Characteristics, ratings and application. 5
(b) Schottkey Diode–characteristics, rating and application. 5
(c) C–L–C filter. 5
(d) BJT as a switch. 5

S.E. ETRX (Rev) Sem III NID-2012

Sub. - DSD-I.

P4-RT-Exam.-Oct.-12-1-311

Con. 9948–12. **KR–3296**

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

N.B. : (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** out of remaining **six**.
(3) Assume **suitable** data wherever **necessary** and state **clearly**.

1. (a) State and prove DeMorgan's theorem. **2**

(b) Obtain odd parity hamming code for '1001' data. Why is hamming code called error correcting code ? Justify. **5**

(c) Differentiate between combinational and sequential circuits. **3**

(d) Constant EX-OR gate using only NOR gates. **5**

(e) Draw circuit of JK flip-flop using NAND gates only. Write its characteristic table and excitation table. **5**

2. (a) Reduce following function using K-map. Get POS and SOP equations. Implement using universal gates and conclude for implementation point of view which form is more economical here ? **10**

$$f = \pi M(1, 4, 5, 6, 7, 8, 9, 14, 15, 22, 23, 25, 28, 29, 30, 31)$$

(b) Write the expression :– **10**

$$Y = A\overline{B}C + \overline{A}C + AB$$

(i) in standard SOP form
(ii) Write minterm list
(iii) Write standard POS form
(iv) Write maxterm list.

3. (a) Simplify the following using Quine-McClusky minimization technique **10**

$$f(x, y, z) = \Sigma m(1, 3, 13, 15) + d(10, 11)$$

(b) What type of static hazards may occure in a combinational logic circuit ? How it can be avoided ? **10**

4. (a) Design and explain Two's complement Subtractor circuit using adder IC 7483. **10**

(b) Implement an even parity checker for a 4 bit data, using 8 : 1 MUX and inverters. **10**

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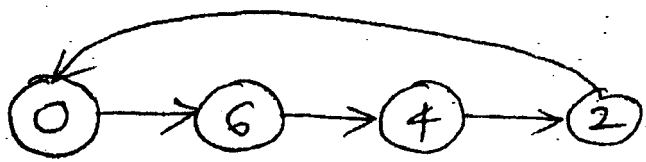
5. (a) Design 3 bit binary to gray code converter using IC 74138. **10**

   (b) Design XY flip-flop using JK flip-flop. Function table of XY flip-flop is as follows:– **10**

X	Y	Q^+
0	0	Q
0	1	$\overline{Q}$
1	0	0
1	1	1

6. (a) Design mod-6 ripple counter. Explain glitch problem along with waveform. **10**

   (b) Design lockout free synchronous counter for the following state diagram using D-flip-flops. **10**



7. (a) Draw and explain 3-bit Jhonson counter. **10**

   (b) Write short notes on – **10**

   (i) ALU

   (ii) Alphanumeric Codes.

S.E. SEM III (ETRX) (CBSGS) ISTNOV-Dec 2012
Control System

7 : 2nd half.12-AM(o)

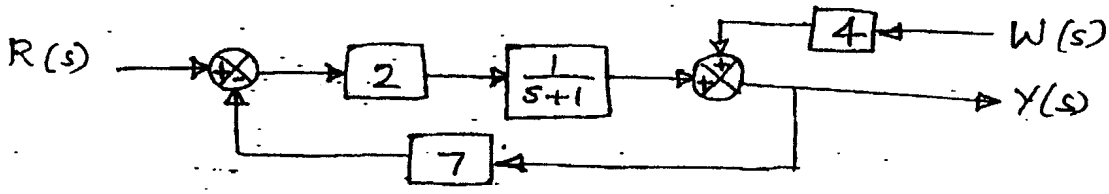
Con. 10650-12. **KR-3524**

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

N.B. : (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** out of the remaining **six** questions.
(3) Assume suitable **data** wherever **necessary**.
(4) **Figures** to the **right** indicate **marks**.

1. Answer any **four** of the following :— **20**

(a) For the block diagram shown, find the Transfer Function between Y(s) and W(s).



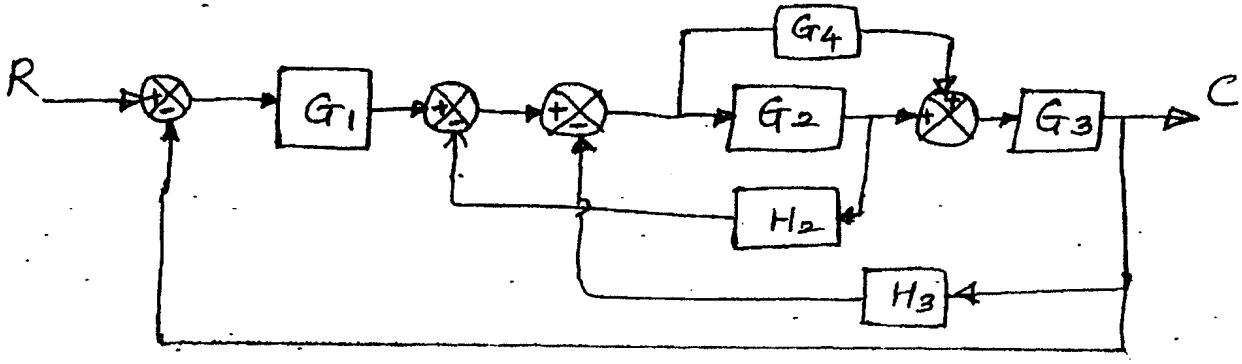
(b) List the type of damping of a second order control system with location of poles.

(c) Compare time and frequency responses and explain the correlation between them.

(d) With an example, determine the relative stability of a system using Routh Stability Criterion.

(e) Define Gain Margin and Phase Margin. Explain how to find them from Magnitude verses Phase plot.

2. (a) Draw the Signal Flow Graph of the given Block Diagram and obtain the closed loop Transfer function using Mason's Gain Formula. **10**



(b) From the given state space model, obtain the Transfer function. **10**

$$A = \begin{bmatrix} -5 & -6 \\ 1 & 0 \end{bmatrix}, B = \begin{bmatrix} 1 \\ 0 \end{bmatrix}, C = [1 \quad 1], D = 0$$

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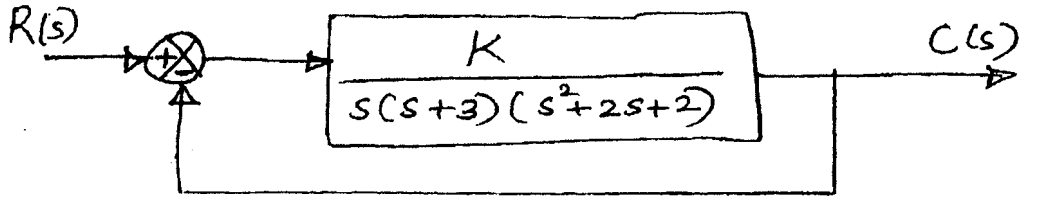
3. (a) Sketch the Root Locus of the system shown and comment on the stability. **10**



(b) A unity feedback control system is characterized by the open loop Transfer function **10**

$$G(s) = \frac{0{\cdot}4s+1}{s(s+0{\cdot}6)}$$

Determine its Transient Response for a unit step input. Evaluate Maximum overshoot and Peak time.

4. (a) Sketch the Bode Plot for the following Transfer function and determine the System Gain crossover frequency, Phase crossover frequency, Gain Margin and Phase Margin. **10**

$$G(s)\,H(s) = \frac{80(s+5)}{s^2(s+50)}$$

(b) Draw the Nyquist Plot and assess the stability of the closed loop system whose open loop transfer function is $G(s)\,H(s) = \dfrac{4s+1}{s^2(s+1)(2s+1)}$ **10**

5. (a) Sketch the Polar Plots for the following :— **10**

(i) $\dfrac{1}{s(1+Ts)}$ (ii) $\dfrac{1}{s^2(1+T_1s)(1+T_2s)}$

(b) A unity feedback system has $G(s) = \dfrac{K}{s(s+1)(0{\cdot}5s+1)}$ and $r(t) = 5t$. (i) Determine the steady state error if $K = 1{\cdot}5$. (ii) Also find the minimum value of K if the steady state error $\leq 0{\cdot}1$ for a unit ramp input. **10**

6. (a) Draw the circuit diagrams of basic lag and lead compensating networks and derive the Transfer function. **10**

(b) Explain the principle of operation and characteristics of a two phase servo motor. **10**

7. Write short notes on the following :— **20**

(a) Synchros
(b) M and N circles
(c) Effects of feedback on sensitivity and stability.

S.E. Sem-III (Rev) ETRx Dec-12

Sub:- ENAS.

V-A4-II-Hf-Ex-12-D-15

Con. 7409-12.

KR-3623

(3 Hours)

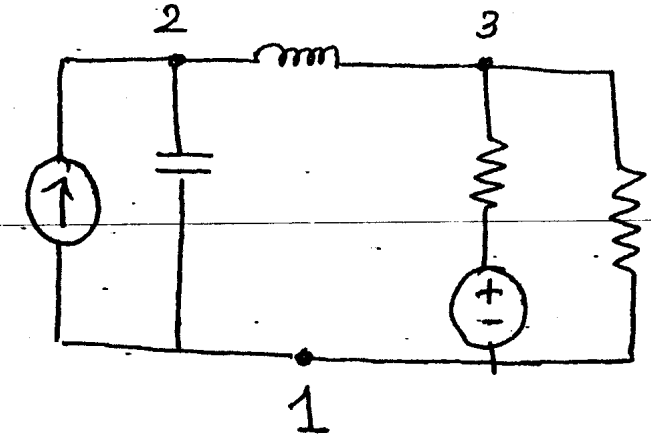
[Total Marks : 100

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

(2) Attempt any **four** questions out of remaining **six** questions.

(3) Make Assumptions wherever **necessary.**

1. (a) How many trees are possible for the graph of the network ? **5**

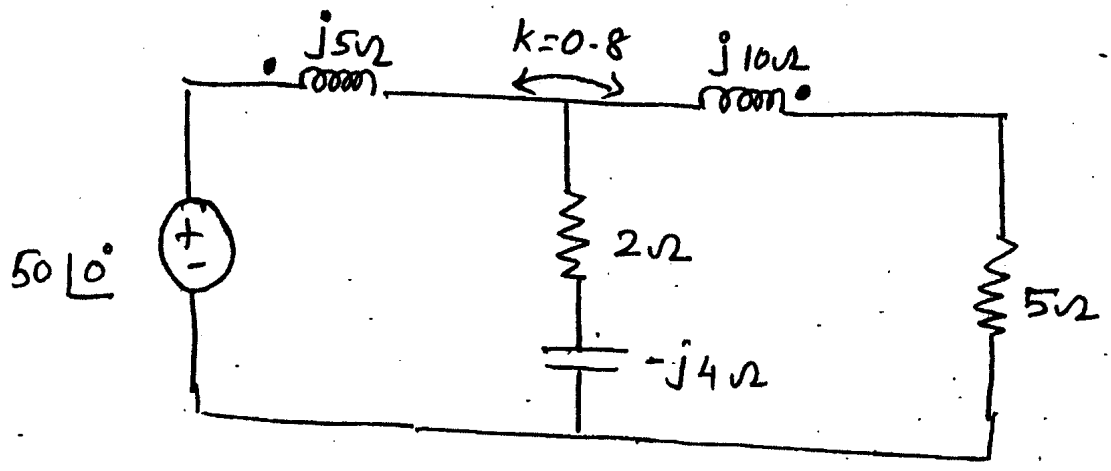


(b) What are the conditions for a rational function f(s) with real co-efficients to be positive real function ? **5**

(c) Express hybrid parameters in terms of impedance parameters. **5**

(d) State the properties of hurwitz polynomial. **5**

2. (a) Find voltage across 5Ω resistor using mesh analysis. **10**



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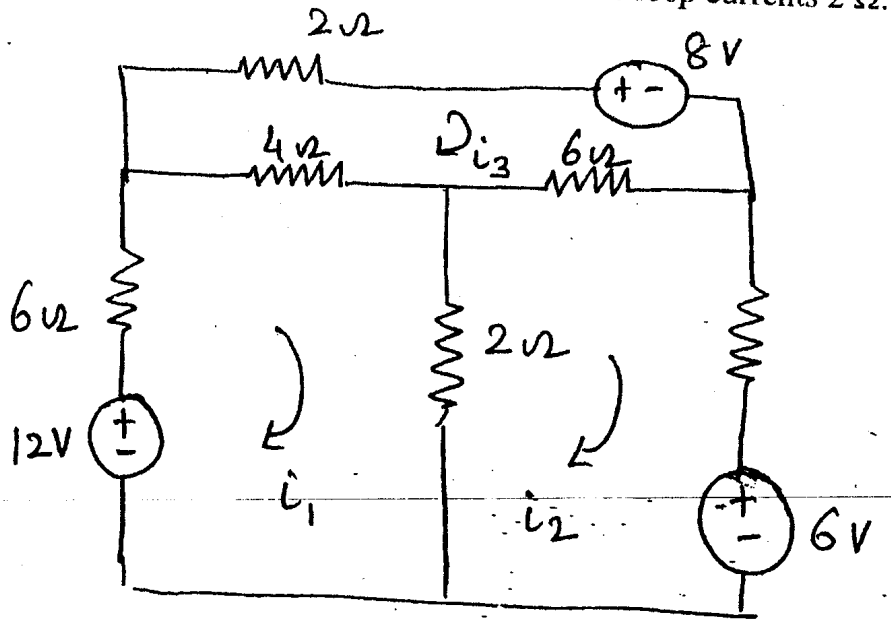
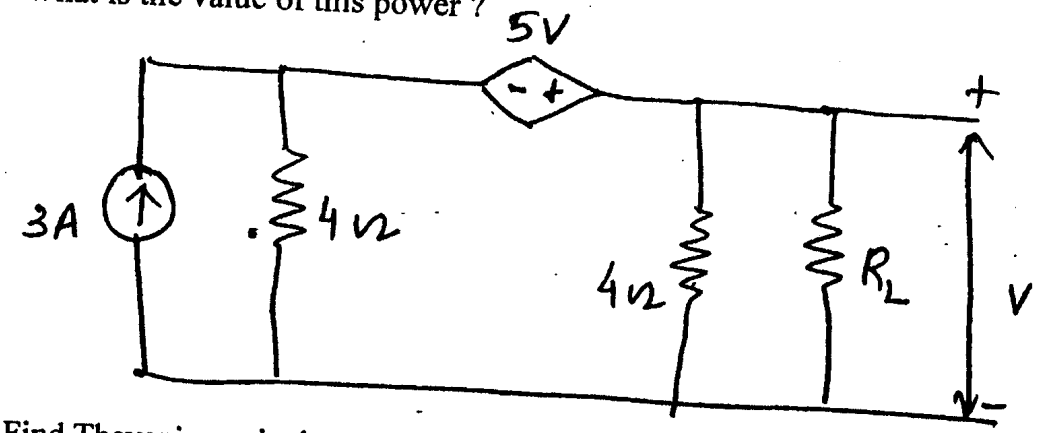
Con. 7409–KR-3623-12. 2

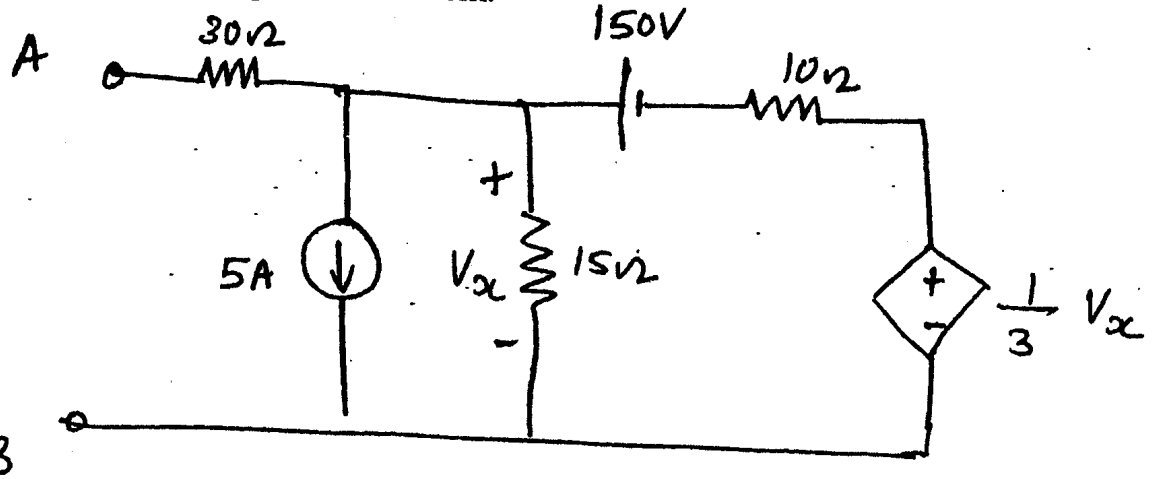
(b) For the network shown write down the tieset matrix and obtain network equillibrium equation in matrix form using KVL. Calculate loop currents 2 Ω. **10**



3. (a) In the network shown what will be the R_L to get maximum power delivered to it ? What is the value of this power ? **10**

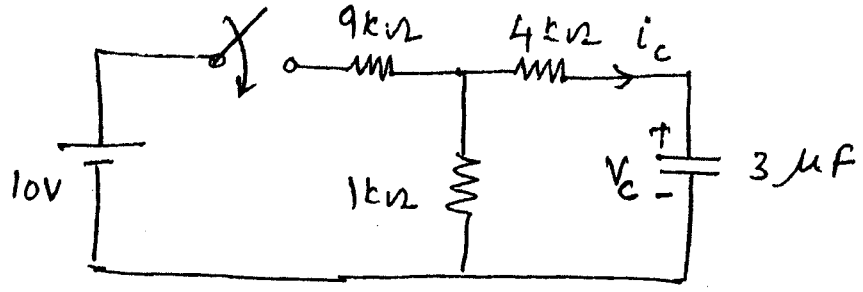


(b) Find Thevenin equivalent network. **10**

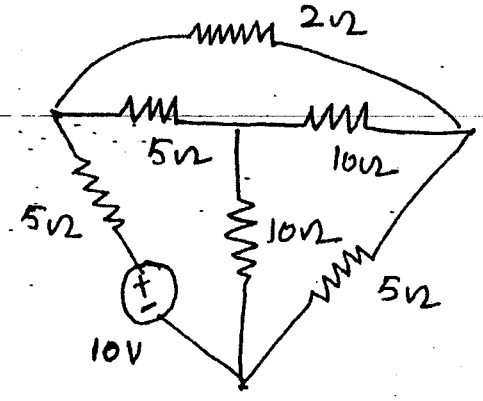


Con. 7409–KR-3623-12.

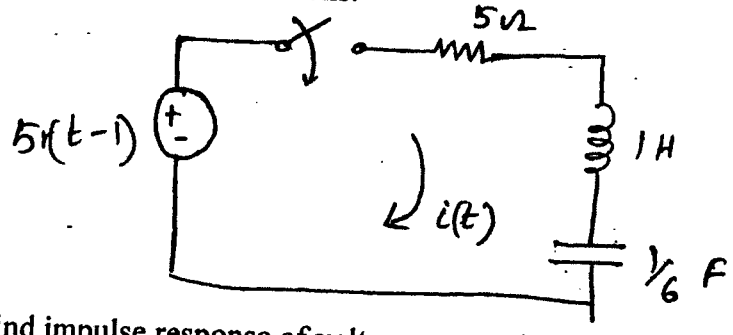
4. (a) In the network shown the switch closes at t = 0. The capacitor is initially uncharged. Find V_c and i_c. **10**



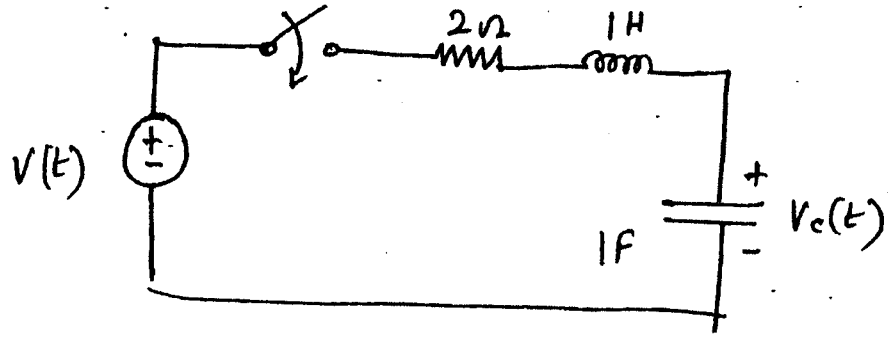
(b) Calculate the twig voltages using KCL equation for the network shown. **10**



5. (a) For the network shown, determine the current i(t) when switch is closed at t = 0 with zero initial conditions. **10**



(b) Find impulse response of voltage across the capacitor in the network shown. Also determine response $V_c(t)$ for step input. **10**

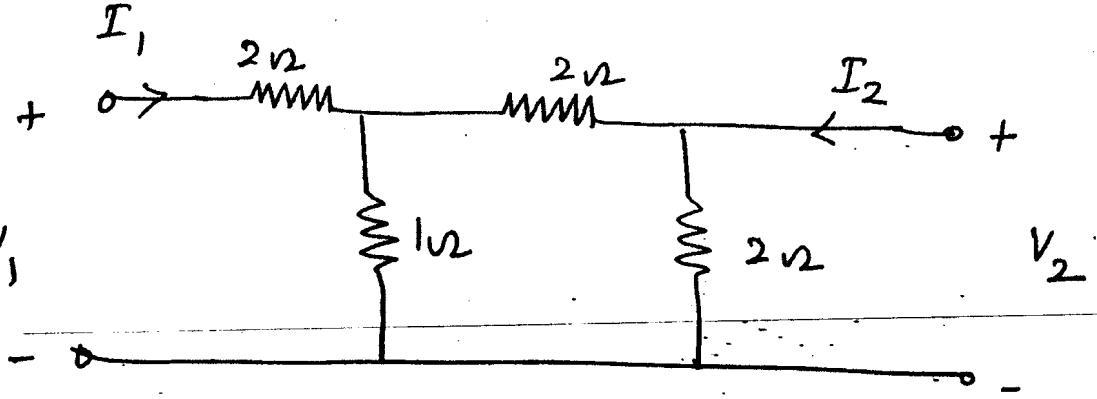


6. (a) Test whether the following polynomial are hurwitz. Use continued fraction Expansion. **10**

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

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

(b) Two identical sections of the network shown are connected in cascade. Obtain the transmission parameters of overall connection. **10**



7. (a) Find the first and second couer form of the given function :— **10**

$$z(s) = \frac{(s+1)(s+3)}{s(s+2)}.$$

(b) Test whether the following functions are positive real function :— **10**

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

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