SE (Extc) Sem-III (old) App mathy

(OLD COURSE) **QP Code :12213**

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

N.B.: (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** questions out of remaining **six** question.

1. (a) Find Laplace transform of {cos(t) cos(2t) cos(3t)}. 5
(b) Show that every square matrix can be uniquely expressed as the sum of a symmetric matrix and skew symmetric matrix. 5
(c) Obtain complex from of fourier series $f(x) = e^{ax}$ in $(-\ell, \ell)$. 5
(d) Find z-transform of $\{a^{|k|}\}$. 5

2. (a) Find Laplace transform of $\left\{\frac{1-\cos(t)}{t^2}\right\}$ 6

(b) If $A = \frac{1}{9}\begin{bmatrix} a & 1 & b \\ c & b & 7 \\ 1 & a & c \end{bmatrix}$ is orthogonal, find a,b & c and A^{-1}. 7

(c) Obtain Forier series of $f(x) = \sqrt{1-\cos(x)}$ in $(-\pi, \pi)$. 7

3. (a) Solve using Laplace transform $\frac{d^2y}{dt^2} + 9y = 18t$ 6

(b) Obtain Fourier Series for $f(x) = x\sin(x)$ in $(0, 2\pi)$. 7
(c) Obtain z-transform of $C^k \sin h(\alpha k)$, $k \geq 0$ 7

4. (a) Obtain Fourier series of $f(x) = 9-x^2$ in $(-3, 3)$. 6
(b) Test for consistency and solve if consistant 7

$$x_1 - 2x_2 + x_3 - x_4 = 2$$
$$x_1 + 2x_2 + 2x_4 = 1$$
$$4x_2 - x_3 + 3x_4 = -1$$

(c) Find inverage z-transform of $f(x) = \frac{3z^2-18z+26}{(z-2)(z-3)(z-4)}$, $3<z<4$ 7

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5. (a) Find Fourier integral representation for $f(x) = 1-x^2 \quad |x| \leq 1$ $= 0 \quad |x| > 1$ 6

(b) Obtain the expansion of $f(x) = x(\pi-x)$, $0 < x < \pi$ as a half range cosine series then 7

show that $\sum_{n=1}^{\infty} \frac{1}{n^4} = \frac{\pi^4}{90}$.

(c) Find the non-singular matrices P and Q such that $A = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 2 & 1 & 4 & 3 \\ 3 & 0 & 5 & -10 \end{bmatrix}$ is reduced to 7

the normal form PAQ. Also find its rank.

6. (a) Using Laplace transform evaluate $\int_0^{\infty} e^{-t}\left(1+2t-t^2+t^3\right)H(t-1)\,dt$. 6

(b) Evaluate using Laplace transform $\int_0^{\infty} e^{-t}\left\{\int_0^t u\cos^2(u)\,du\right\}\,dt$ 7

(c) Find inverse Laplace of $\tan^{-1}\left(\frac{2}{s^2}\right)$. 7

7. (a) Using convolution theorem find the Inverse Laplace transform of $\left\{\frac{1}{(s^2+4s+13)^2}\right\}$.

(b) If $N = \begin{bmatrix} 0 & 1+2i \\ -1+2i & 0 \end{bmatrix}$ then show that $(I-N)(I+N)^{-1}$ is a unitary matrix. 7

(c) Obtain Fourier series for the function $f(x) = \begin{cases} 1+\frac{2x}{\pi} & -\pi \leq x \leq 0 \\ 1-\frac{2x}{\pi} & 0 \leq x \leq \pi \end{cases}$ 7

Reduce that $\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + --$.

(OLD COURSE) **QP Code : 12249**

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

N.B. : (1) Question No. 1 and 2 **compulsory.**
(2) Attempt any **three** question from The remaining question.
(3) In all **five** questions to be attempted.
(4) **Figures** to the **right** indicate **full** marks.

1. (a) Design single stage CE Amplifier to provide following specifications **15**
Av $\geq$ 150, Vo =3.5v, $F_L \leq 40$ Hz, $S_{ICO} \leq 10$ use transistor BCI47A.
(b) For the above designed amplifier find expected voltage gain, input impedance output impedance and maximum undistorted output voltage and its corresponding input voltage. **5**

2. (a) The circuit shown uses a silicon transistor with β=50, V_{BE} =0.6 v, V_{CC} = 21v, and R_C =5.6 kΩ. Find the values of the resistors R_E, R_1 and R_2 so that Q point is set at V_{CE} = 12v and I_C =1.5 mA. The stability factor S $\leq$ 3. (fig.1) **10**

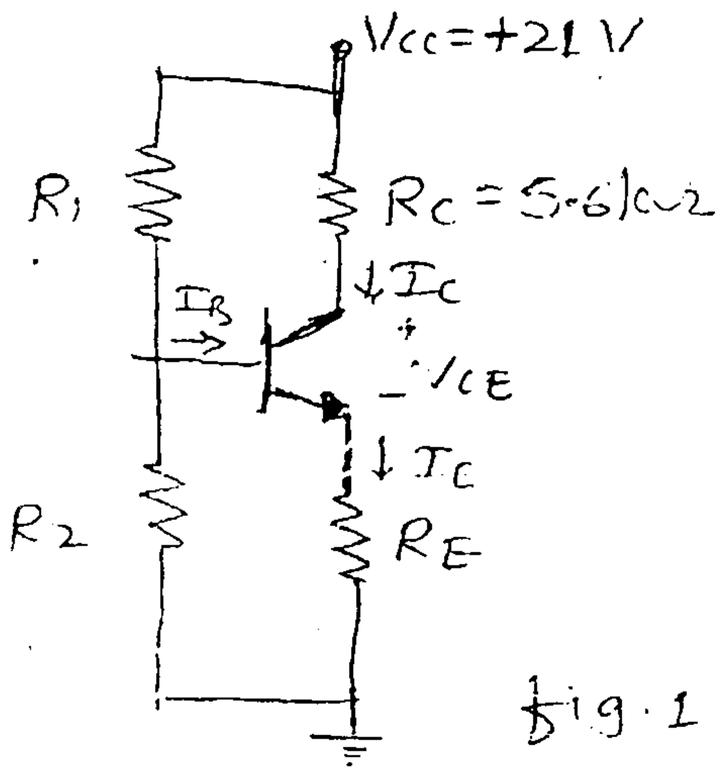


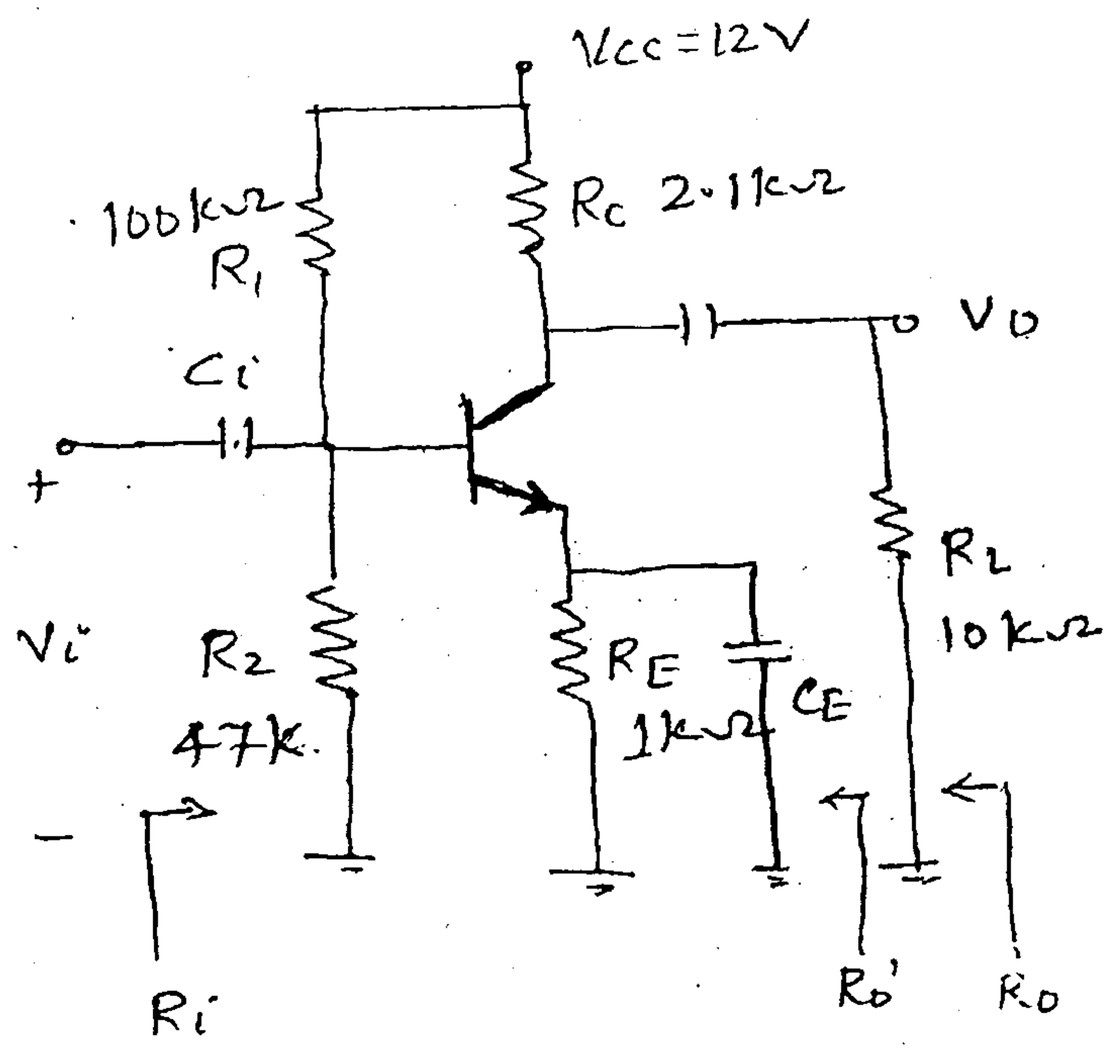
fig. 1

(b) What are the important JFET parameters and define it from characteristics. **10**

3. (a) Explain working of capacitor filter with full wave rectifier and derive the expression for the ripple factor. Also explain the effect of load resistor on ripple factor. **10**
(b) Design a zener shunt voltage regulator to meet the following specification **10**
Vo=7v, I_L =10mA, Pzmax = 500mw, Izmin = 2mA, and Vi = 15 ± 5v. **10**

4. (a) Draw small signal hybrid parameter circuit for CE amplifier and define h-parameters from characteristics of transistor. **10**

(b) For the amplifier shown in figure. 2 below. Analyse and determine, Av, A_I, Ri and Ro. **10**



hie = 1.5kΩ
hfe = 110
hre = hoe = 0

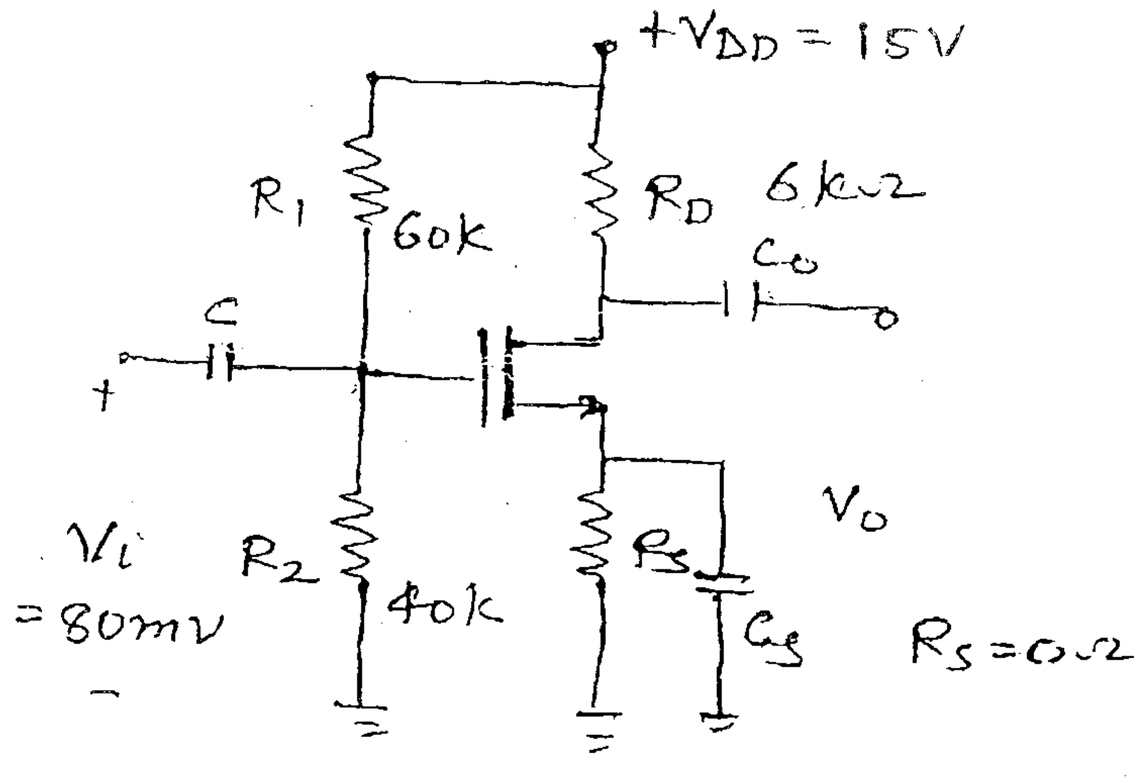
Fig. 2

5. (a) Draw common source amplifier with self bias circuit and derive the expression for voltage gain, input impedance and output impedance. **10**
What is the effect of removing bypass capacitor on voltage gain, Ri and Ro.

(b) Explain with the help of neat circuit diagram, working of UJT relaxation oscillator and derive expression for frequency of oscillation. **10**

6. (a) Compare JFETs and MOSFETs. **10**

(b) An n-channel E-MOSFET with common source amplifier, shown in figure, has the following parameters: $I_{D(ON)}$ = 4mA, at $V_{GS(ON)}$ = 8v, V_{TN} = 4V. gm= 2000 µs. Determine V_{GS}, I_D, V_{DS}, output voltage. Ri and Ro. **10**



7. Explain the following (any **four**) **20**

(a) Latching and holding current in SCR.

(b) Bleeder resistance and critical inductance

(c) Power MOSFET

(d) Opto couples

(e) BJT as a switch.

Transistor type	P_{dmax} @ 25°C Watts	I_{cmax} @ 25°C Amps.	$V_{CE(sat)}$ volts d.c.	V_{cao} volts d.c.	V_{CEO} (Sus) volts d.c.	V_{CER} (Sus) volts d.c.	V_{CEX} volts d.c.	V_{BEO} volts d.c.	T_j max. °C	D.C. current gain min	D.C. current gain typ.	D.C. current gain max.	Small Signal min.	Small Signal typ.	h_{fe} max.	V_{BE} max.	θ_{ja} °C/W	Derate above 25°C W/°C
2N 3055	115.5	15.0	1.1	100	60	70	90	7	200	20	50	70	15	50	120	1.8	1.5	0.7
ECN 055	50.0	5.0	1.0	60	50	55	60	5	200	25	50	100	25	75	125	1.5	3.6	0.4
ECN 149	30.0	4.0	1.0	50	40	–	–	8	150	30	50	110	33	60	115	1.2	4.0	0.3
ECN 100	5.0	0.7	0.6	70	60	65	–	6	200	50	90	280	50	90	280	0.9	35	0.05
BC 147A	0.25	0.1	0.25	50	45	50	–	6	125	115	180	220	125	220	260	0.9	–	–
2N 525 (PNP)	0.225	0.5	0.25	85	30	–	–	–	100	35	–	65	–	45	–	–	–	–
BC 147 B	0.25	0.1	0.25	50	45	50	–	6	125	200	290	450	240	330	500	0.9	–	–

Transistor type	h_{ie}	h_{oe}	h_{re}	θ_{ja}
BC 147 A	2.7kΩ	18μmho	1.5×10^{-4}	0.4°C/mW
2N 525 (PNP)	1.4kΩ	25μmho	3.2×10^{-4}	—
BC 147B	4.5kΩ	30μmho	2×10^{-4}	0.4°C/mW
ECN 100	50Ω	–	—	—
ECN 149	15Ω	–	—	—
ECN 055	12Ω	–	—	—
2N 3055	6 Ω	–	—	—

BFW 11-JFET MUTUAL CHARACTERISTICS

$-V_{GS}$ volts	0.0	0.2	0.4	0.6	0.8	1.0	1.2	1.6	2.0	2.4	2.5	3.0	3.5	4.0
I_{DS} max. mA	10	9.0	8.3	7.6	6.8	6.1	5.4	4.2	3.1	2.2	2.0	1.1	0.5	0.0
I_{DS} typ. mA	7.0	6.0	5.4	4.6	4.0	3.3	2.7	1.7	0.8	0.2	0.0	0.0	0.0	0.0
I_{DS} min.mA	4.0	3.0	2.2	1.6	1.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

N-Channel JFET

Type	$V_{DS\ max.}$ Volts	$V_{DG\ max.}$ Volts	$V_{GS\ max.}$ Volts	$P_{d\ max.}$ @ 25°C	$T_{j\ max.}$	I_{DSS}	g_{fs} (typical)	$-V_p$ Volts	r_d	Derate above 25°C	θ_{ja}
2N3822	50	50	50	300 mW	175°C	2 mA	3000 μ mho	6	50 KΩ	2 mW/°C	0.5°C/mW
BFW 11 (typical)	30	30	30	300 mW	200°C	7 mA	5800 μ mho	2.5	50 KΩ	–	0.6°C/mW

SE EXTC (old) III Dec 2014 DLD (Digital ... Dep...

(OLD COURSE) **QP Code :12289**

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

N.B. : (1) Question No. 1 is **compulsory**.
(2) Attempt any **four** from remaining **six** questions.
(3) Figures to the **right** indicate **full** marks.

1. (a) Convert $(154{\cdot}25)_{10}$ into binary, octal and hexadecimal number systems. 5
(b) Design one bit digital comparator. 5
(c) Design a full adder using 8 : 1 MUX. 5
(d) Simplify the following using Boolean laws. 5

$$f = \overline{A}\,\overline{B}\,\overline{C} + A\,\overline{B}\,\overline{C} + B\,C + \overline{A}\,\overline{B}\,C + A\,\overline{B}\,C$$

2. (a) Simplify using k-map and realize using NAND gates only. **10**

$$f(A, B, C, D) = \sum m(1,3,7,11,15) + d(0,2,5)$$

(b) Using Boolean laws prove that NAND and NOR gates as universal gates. **10**

3. (a) Design a BCD to 7 segment code converter. **10**
(b) Draw a 3 bit binary up-down counter using JK-FF. **10**

4. (a) What is a race around condition ? How it is overcome in Master Slave J-K Flip-Flop. **10**
(b) Design a 3 bit Binary to Gray code converter ad implement. **10**

5. (a) Draw a 4 bit universal shift register and explain its operation as shift left and right. **10**
(b) Draw a 2 input TTL NAND gate and explain its operation. **10**

6. (a) Simplify using Quine McClusky Method. **10**

$$f(A,B,C,D) = \sum m(0,1,2,3,4,6,8,9,10,11)$$

(b) Implement the following expression using basic logic gates. **10**

$$f(A, B, C, D) = \sum m(0, 1, 3, 5, 7, 9, 10, 15)$$

7. Write short notes on any **two** :— 20
(a) Priority Encoder
(b) TTL Vs CMOS logic family
(c) PAL and PLA
(d) FPGA and CPLD.

SE EXTC Sem 3 (old)
EI

8/12/14.

QP Code :12321

(OLD COURSE)

(3 Hours) [Total Marks : 100

N.B.: 1. Question no. **1** is **compulsory**.

2. Out of remaining questions attempt any **four** questions.

3. Assume suitable **data** if **required**.

4. **Figures** on **right** hand side indicate marks.

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1. Solve any four [20]
   a. Explain data transmission techniques.
   b. Explain universal counter.
   c. Explain intensity modulation and velocity modulation in CRO.
   d. Explain the block diagram of data logger. State its few areas of application.
   e. Explain the factors that cause errors during Q measurement.

2. a. Explain how Q meter is used for the measurement of low impedance. What are the various sources of errors in Q meter. [10]
   b. With the help of diagram explain construction and operation of RTD. [10]

3. a. What are Lissajous patterns? How they are use for measurement of frequency and phase? [10]
   b. Explain the principle of operation of strain gauge. Explain different types. [10]

4. a. Draw and explain the block diagram of DSO. Describe the various modes of operation. [10]
   b. A 4-bit R-2R ladder type digital to analog converter has input 1010 and reference voltage 10 V. Find its output voltage and conversion resolution. [6]
   c. A 41/2 digit voltmeter is used for voltage measurement. [4]
      I. How 15.684V would be displayed on 2V, 20V, 200V range.
      II. How 0.6935 would be displayed on 2V, 20V range.

5. a. Explain the functions of various controls on front panel of CRO. [10]
   b. Explain the working principle of network analyzer with block diagram. [10]

6. a. With the help of block diagram explain the function of digital frequency meter. [10]
   b. Explain Pulse code modulation technique. [10]

7. a Explain Total Harmonic Distortion analyzer. [6]
   b. Explain various performance parameters of ADC. [7]
   c. Explain Phase shift keying using block diagram. [7]

S.E. Sem. III (OLD) Extc 12/12/2014
Numerical Techniques

QP Code : 12340

(OLD COURSE)

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

N.B. (1) Question No. **1** is **compulsory.**
(2) Attempt any **four** out of remaining **six** questions.
(3) Make **suitable** assumptions if **required** and **justify** the **same.**

1. **(a)** Find absolute, relative and percentage error in following numbers. Determine number of significant digits. **5**

i) a = 123.41769543 $\overline{a}$ = 123.41
ii) b = 0.0053102500 $\overline{b}$ = 0.0051
iii) c = 450550 $\overline{c}$ = 450552

(b) Define the operators $\Delta, \nabla, \delta, \mu$ & E. Prove that **5**

i) $2\mu\delta = \Delta + \nabla$ ii) $E = 1 + \Delta$

(c) Using Picard's method solve **5**

$\frac{dy}{dx} = 1 + xy$ such that $y = 0$ when $x = 0$.

(d) Derive the equation for Regula – falsi method using geometrical interpretation. **5**

2. **(a)** List the bracketing methods and open methods and find the real root of the equation $x^3 - 4x - 9 = 0$ using Newton Raphson method correct to three decimal places. **10**

(b) Solve the following equations by Gauss - Seidel method. **10**
$27x + 6y - z = 85$, $6x + 15y + 2z = 72$, $x + y + 54z = 110$.

3. **(a)** From the following table find the number of students who obtained marks less than 45. **10**

Marks	30-40	40-50	50-60	60-70
No. of students	31	42	51	35

(b) Using Newton's divided difference formula, find the value of **f(9)** from the following table. **10**

x	5	7	11	13	17
$f(x)$	150	392	1452	2366	5202

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4. (a) Write a program for Lagrange's interpolation method and using this formula, find the value of y when $x = 10$ from the following table. 10

x	5	6	9	11
y	12	13	14	16

(b) The result of measurement of electric resistance R of a copper bar at various temperatures t^0C are listed below: 10

t	19	25	30	36	40	45	50
R	76	77	79	80	82	83	85

Find a relation $R = a + bt$

5. (a) The velocity of the train which starts from rest is given by the following table, the time being reckoned in minutes from the start and speed in km/hour. 10

Time	3	6	9	12	15	18
Velocity	22	29	31	20	4	0

Estimate approximately the distance covered in 18 minutes by Simpson's $3/8^{th}$ rule.

(b) Solve $\frac{dy}{dx} = x + y^2$ with $x_0 = 0$, $y_0 = 1$ by Euler's modified formula find the value of y when $x = 0.5$ taking $h = 0.25$. 10

6. (a) Solve $\frac{dy}{dx} = x + y$ with initial conditions $y(1) = 2$ and find y at $x = 1.2$, $x = 1.4$ by Runge - Kutta Method of Fourth Order taking $h = 0.2$. 10

(b) Solve the following set of equations using Gauss Elimination method. 10

$2x + y + z = 10$, $3x + 2y + 3z = 18$, $x + 4y + 9z = 16$.

7. (a) Explain the propagation of errors. 5

(b) Using Adams – Bashforth method, obtain the solution of $\frac{dy}{dx} = x - y^2$ 10

at $y(0.8)$, given values

x	0	0.2	0.4	0.6
y	0	0.0200	0.0795	0.1762

(c) Write a short note on Golden section search. 5

S.E. (EXTC) (old) Sem-III

Sub: Electrical Networks

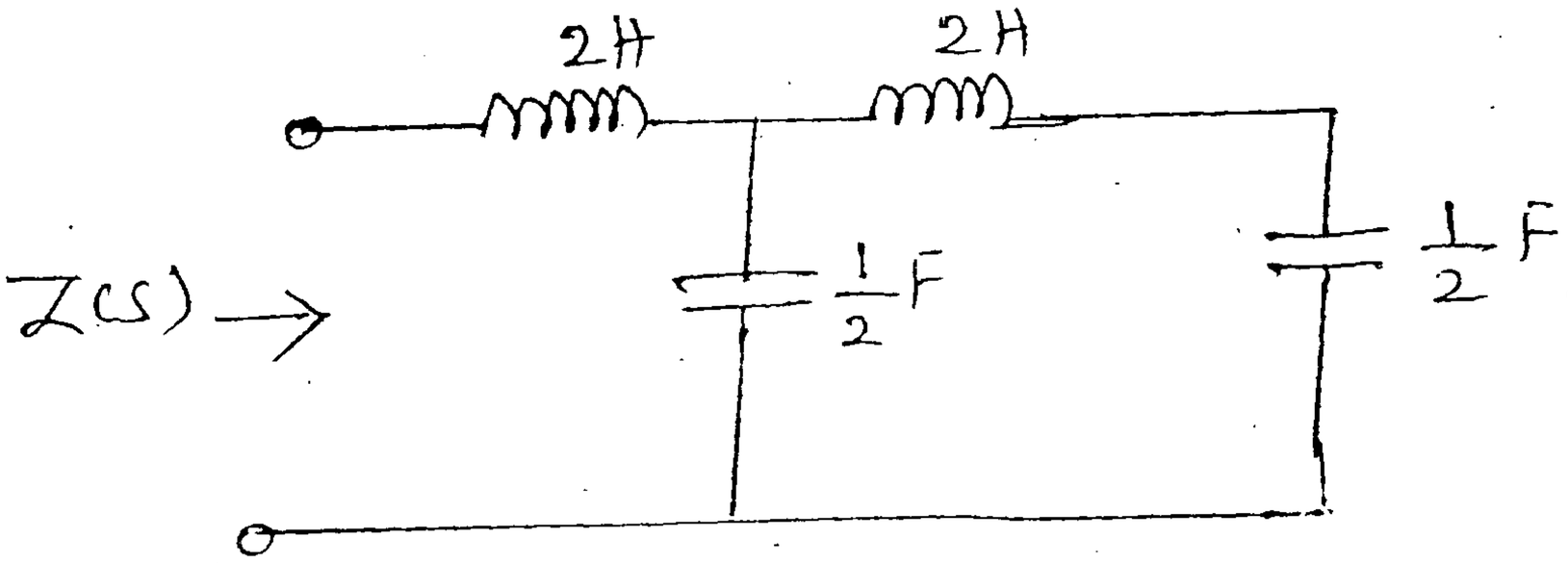
QP Code : **12387**

(OLD COURSE)

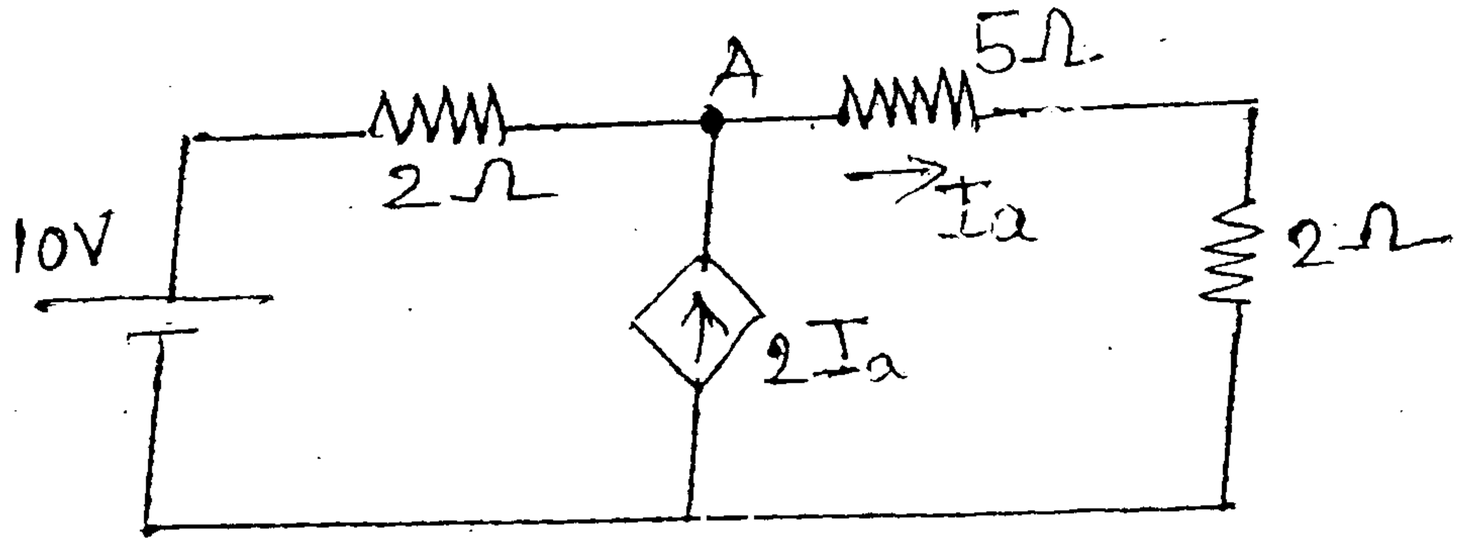
(3 Hours) **[Total Marks : 100**

N.B : (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** questions from remaining **six** questions.
(3) Assume **suitable** additional data if **necessary** and state them **clearly**.

1. (a) Find the driving point impedance of network. **5**



(b) Find I_a and V_A **5**

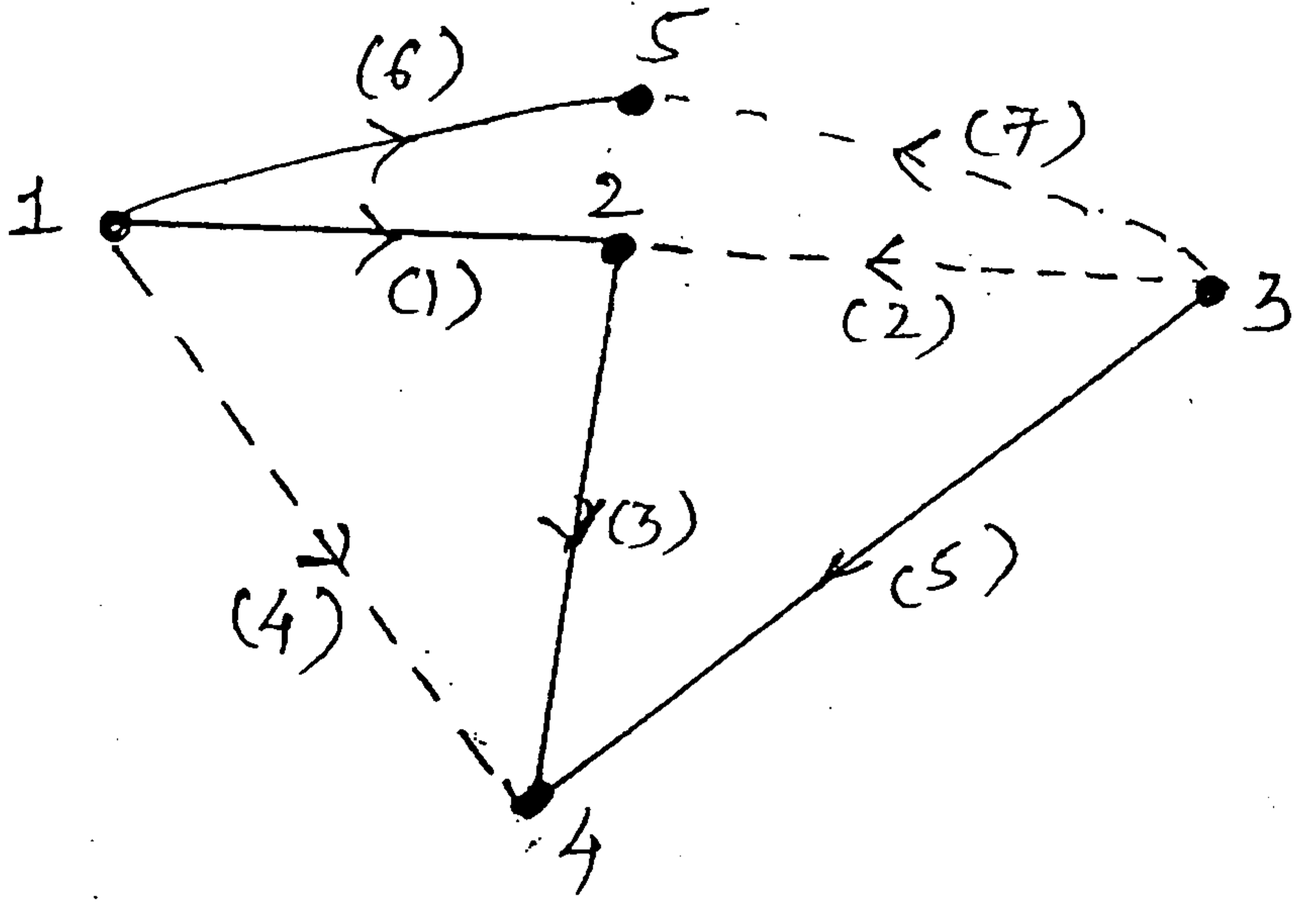


(c) Check for Hurwitz, $F(s) = s^4 + 3s^2 + 2$. **5**

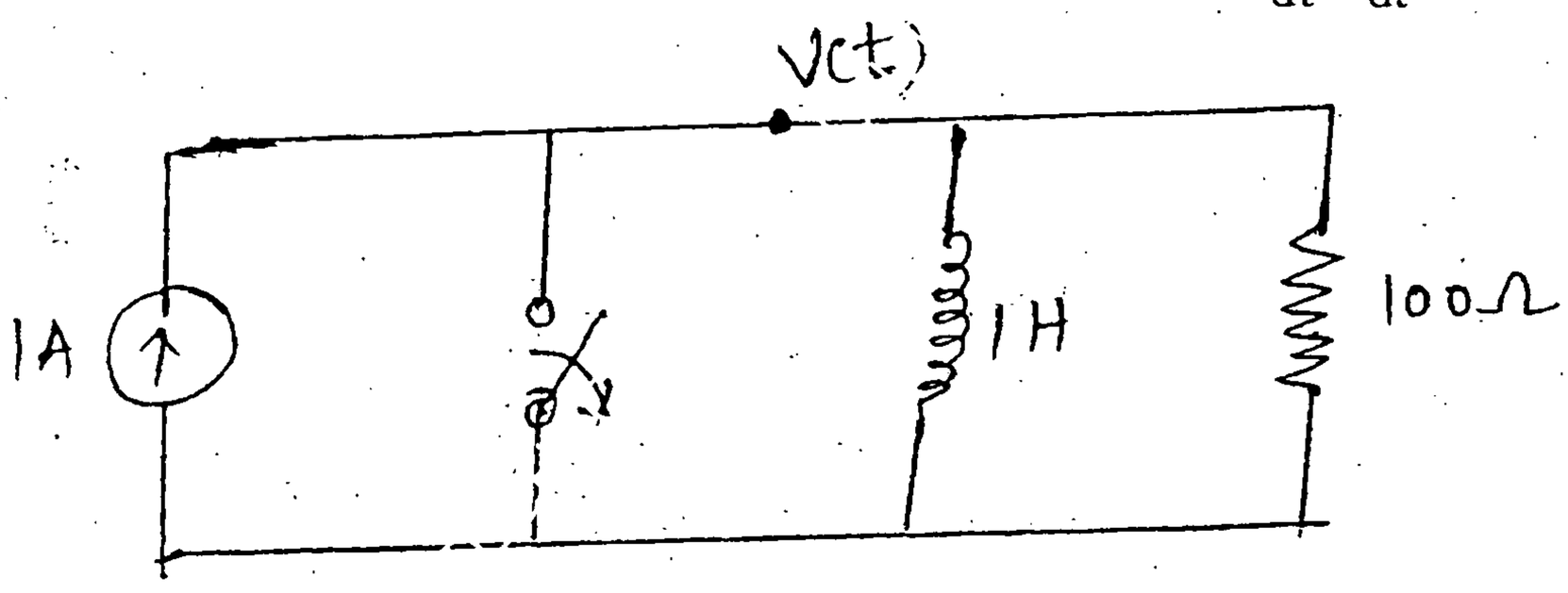
(d) For the given reduced incidence matrix, obtain linear graph. **5**

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

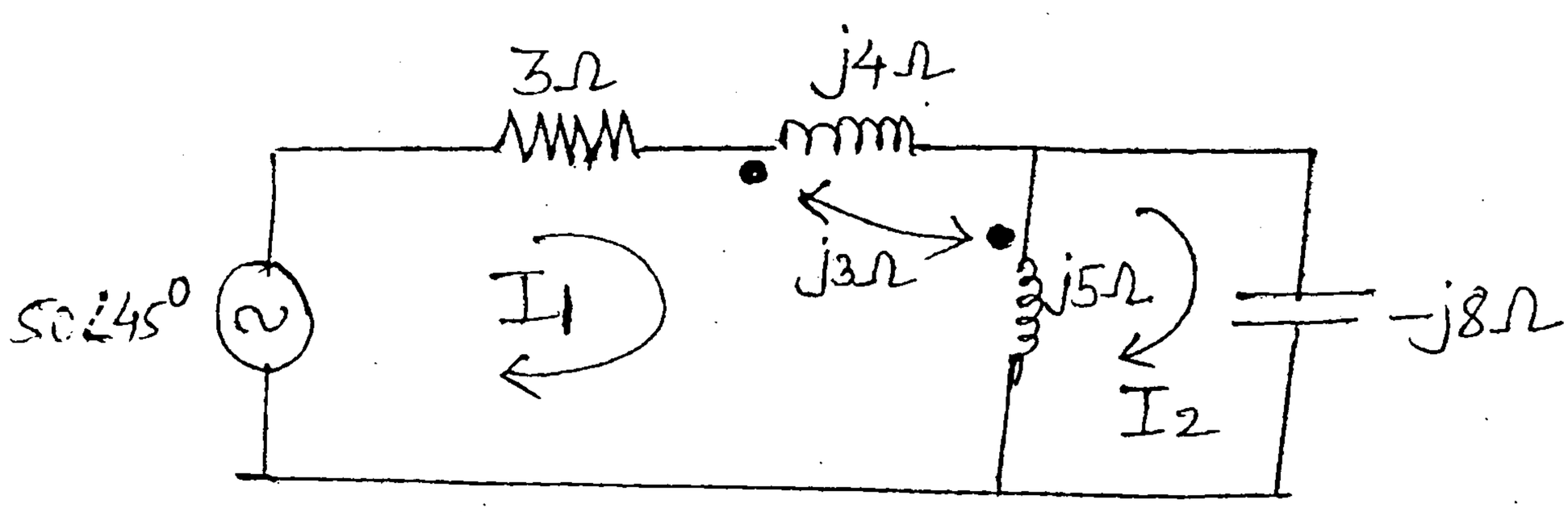
2. (a) For the given tree (shown with firm lines) obtain. **10**
   (i) Incidence matrix
   (ii) Fundamental cutset matrix
   (iii) Fundamental tieset matrix.



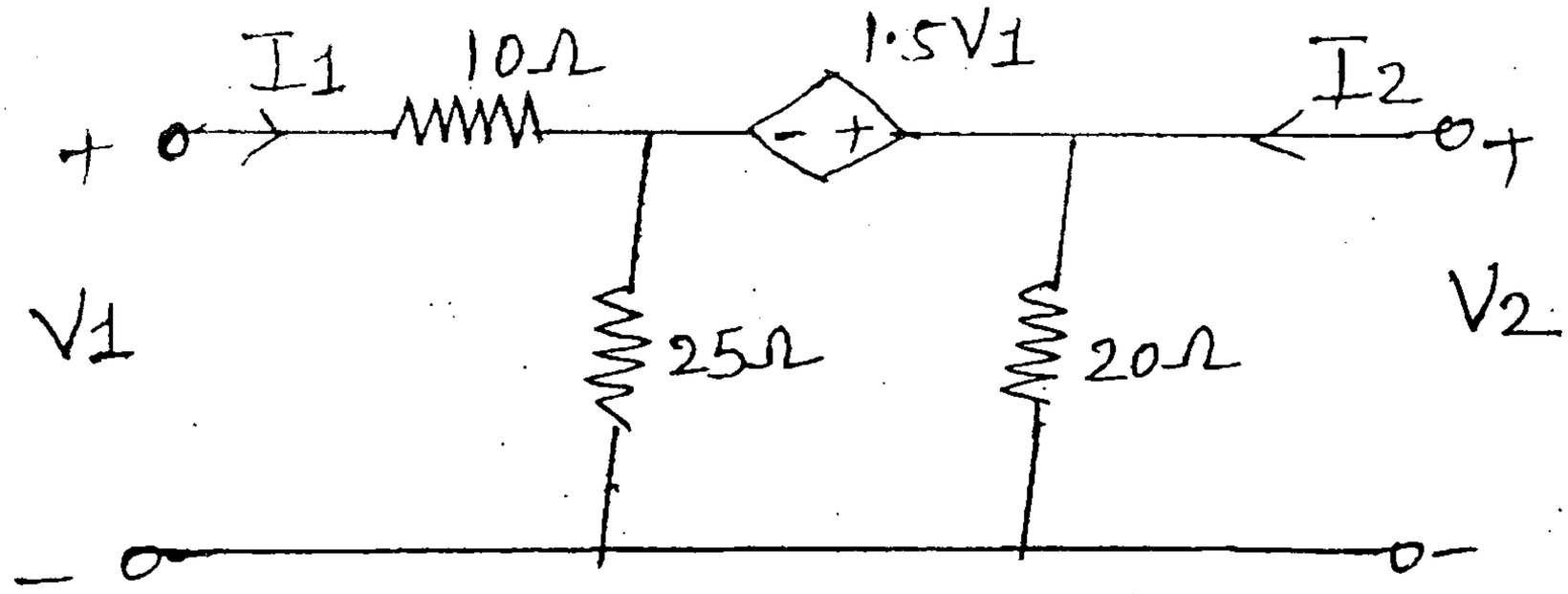
(b) For the given network at t = 0, switch is opened. Calculate V, $\frac{dV}{dt}$, $\frac{d^2V}{dt^2}$ at $t = 0^+$. **10**



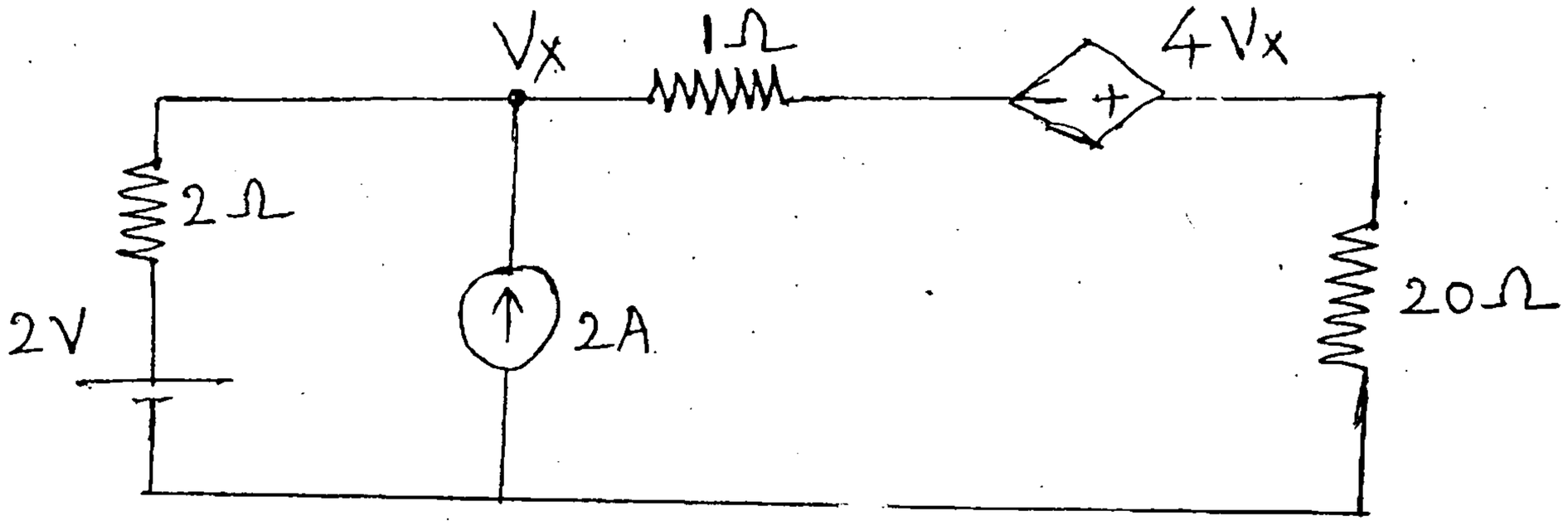
3. (a) Find the current i, using mesh analysis **10**



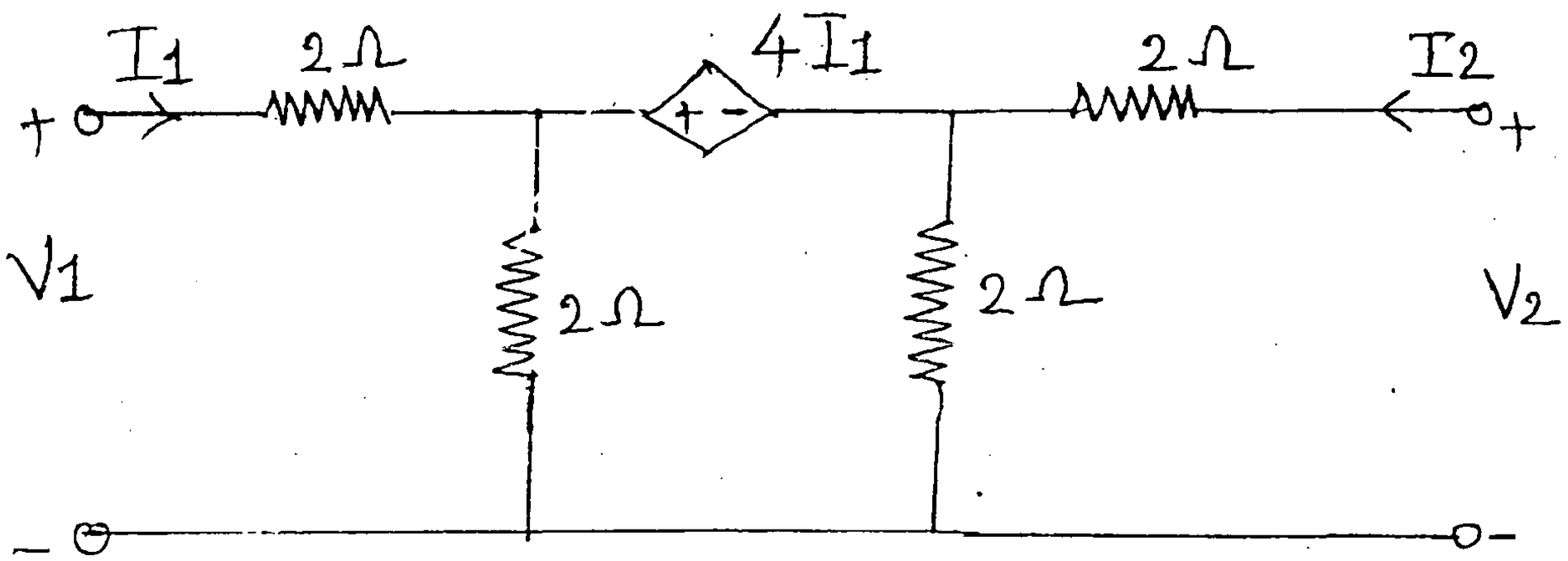
(b) For the network shown below, find transmission parameters.. 10



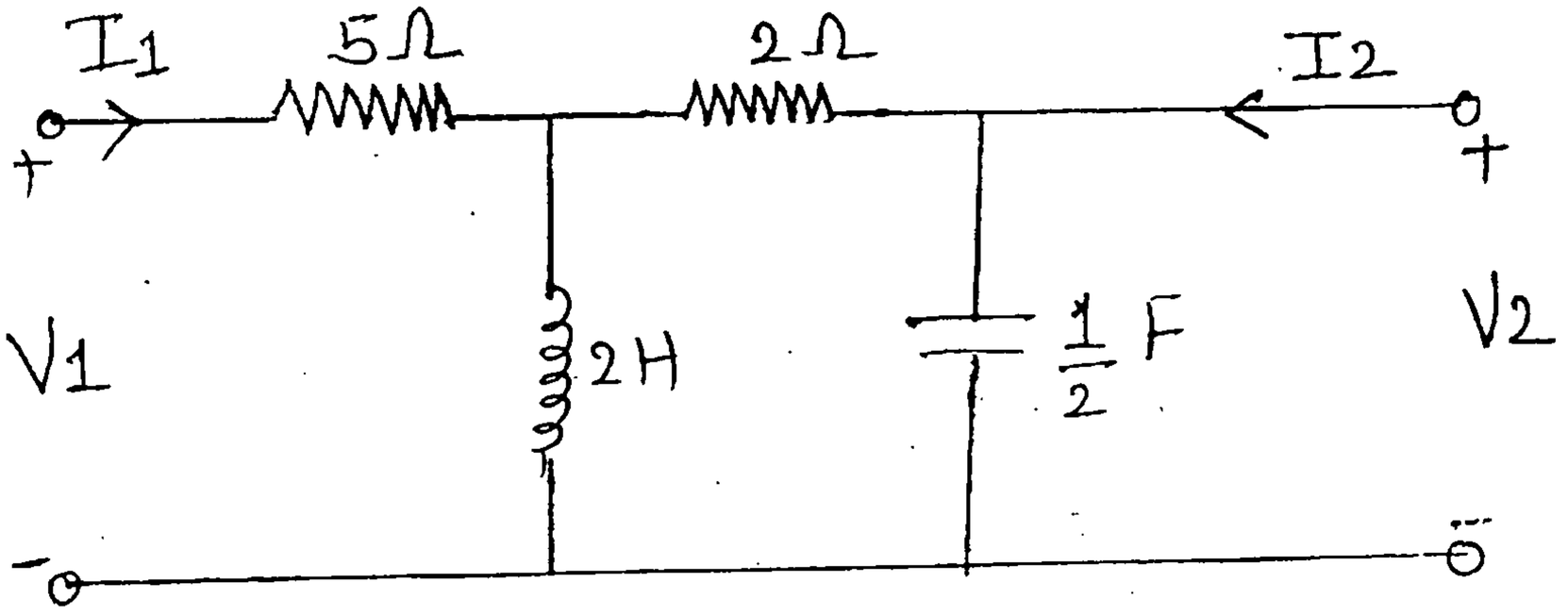
4. (a) Find the current in 20Ω resistor using Thevenin's theorem. 10



(b) For the network shown below, find Z-parameters. 10



5. (a) For the given network, find $\frac{V_1}{I_1}$, $\frac{V_2}{I_1}$, and $\frac{V_2}{V_1}$. **10**

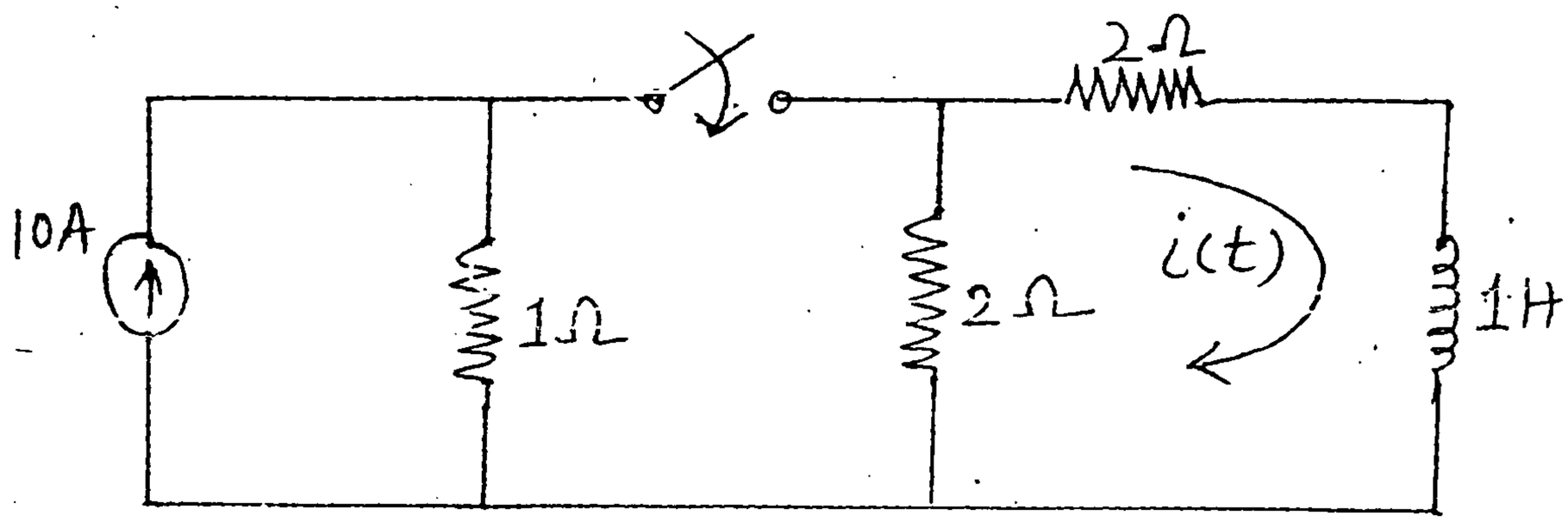


(b) Check the positive realness of the following functions : **10**

(i) $\frac{s^2+s+6}{s^2+s+1}$

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

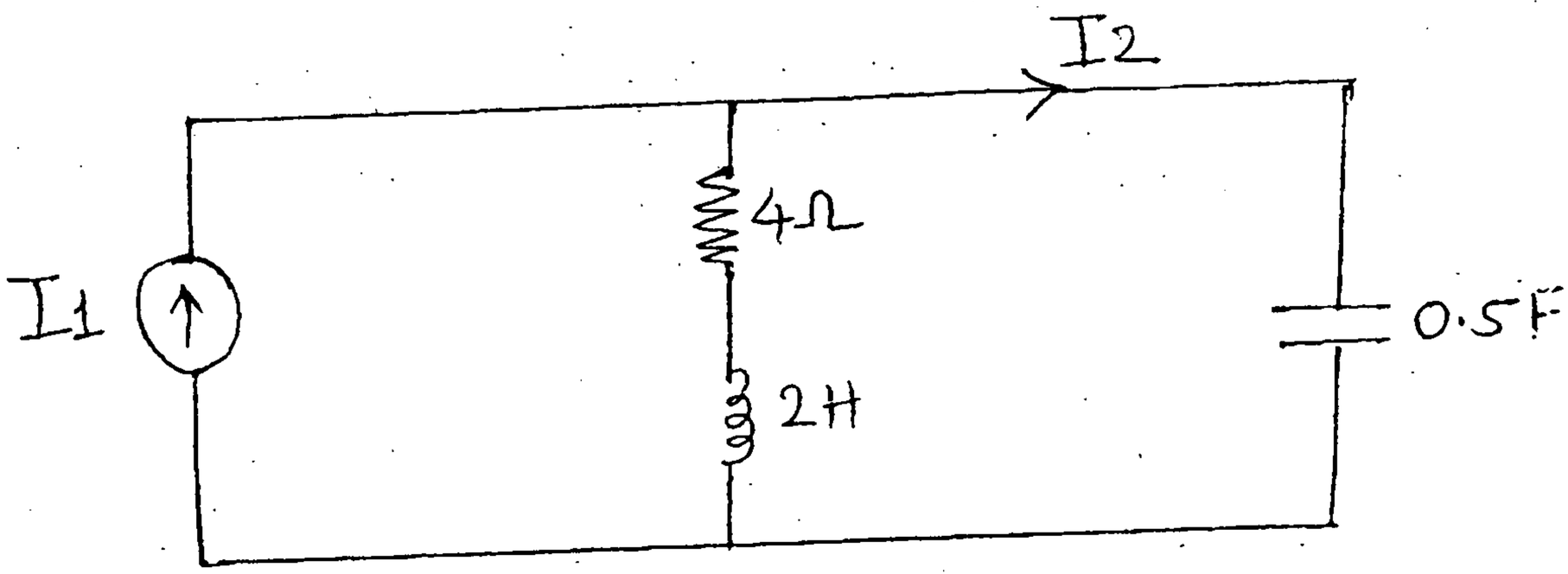
6. (a) For the given network shown below, the switch is closed at t = 0. Find i(t) for t > 0 **10**



(b) Realize the given driving point impedance function using Foster I and II forms. **10**

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

7. (a) For the network shown below, draw pole zero plot for $\frac{I_2}{I_1}$. 10



(b) For the network shown below, the switch is opened for a long time and it closes at t = 0. Find i(t) for t > 0. 10