S.E. EXTC (III) (old). 20/5/15.

EDC-I.

(OLD COURSE) Q.P. Code : **4679**

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

N.B.: (1) Question Nos. **1** is **compulsory.**
(2) Attempt **any four** questions from the remaining **six** questions.
(3) Figures to the **right** indicate **full** marks.
(4) Assume suitable data whenever necessary but justify the same.

1. Design a single stage CE amplifier suitable for low frequencies upto 10Hz, to give a voltage gain $|AV| \geq 80$ and output voltage of 4.5V employing transistor BC147A. Calculate the expected |AV| and maximum output voltage that can be obtained from circuit. Also calculate input resistance of the circuit specify clearly the supply voltage Vcc. Select stability factor $S \leq 10$. **20**

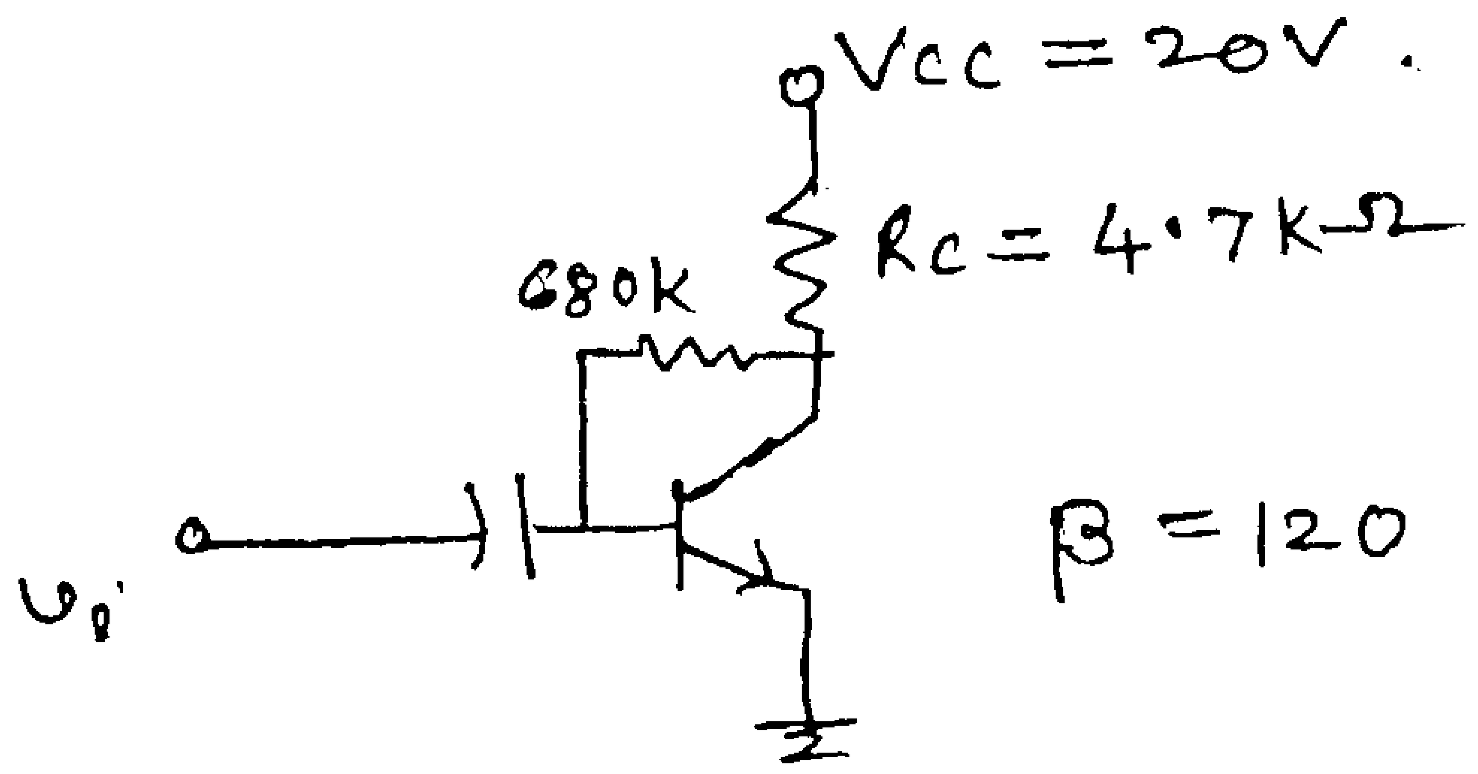
2. (a) Design a single stage common source amplifier for audio frequency applications suitable for operation upto low frequency of 20Hz. Use JFET type BFW-11 to give output voltage of 2V. and voltage gain $|AV| = 10$ **15**
For design use mutual characteristics of VGS - IDS(typ) given in data sheet.

Design for $ID = \frac{IDSS}{2}$

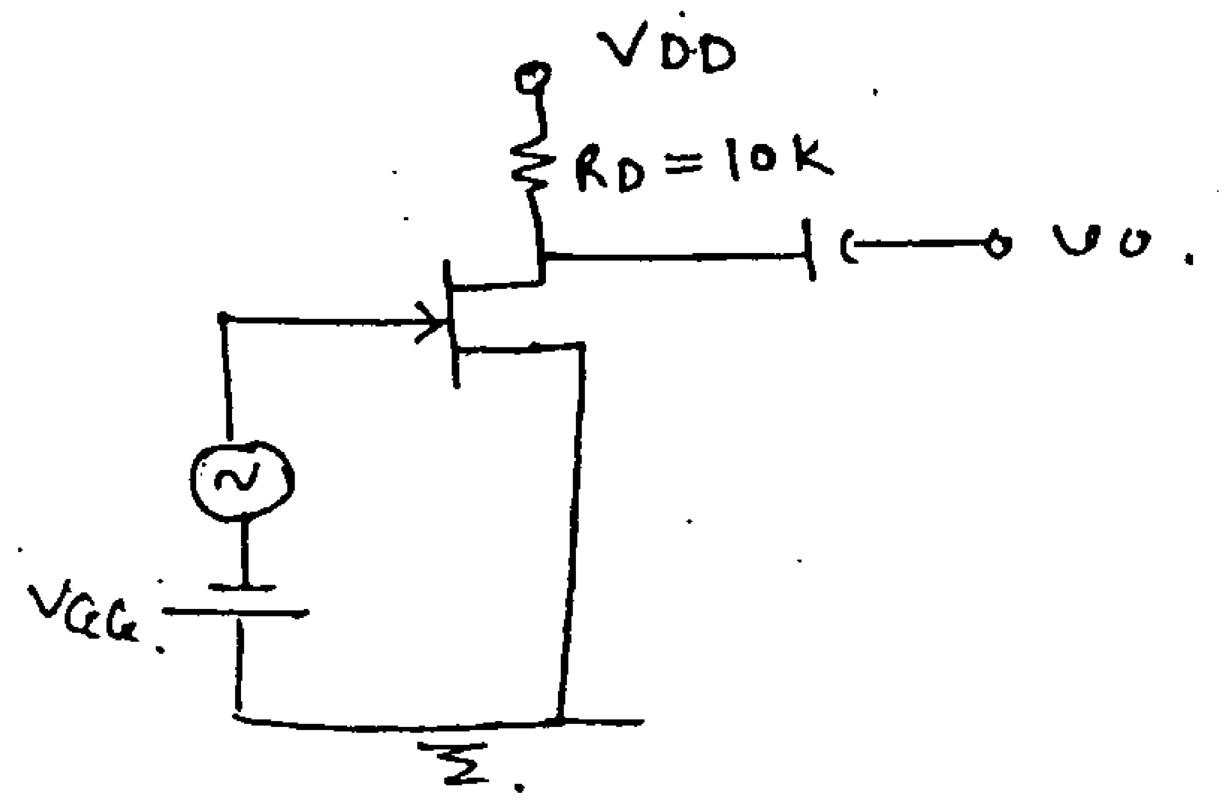
(b) Calculate **5**
(i) input impedance
(ii) output impedance
(iii) voltage gain for the designed circuit.

3. (a) Explain the operation of transistor series regulator with one transistor, derive expression for line & load regulation for the same. **10**
(b) Draw output characteristics of common emitter configuration. Show how transistor amplifies a time varying signal by drawing a DC load line on the characteristics. **10**

4. (a) For the circuit shown in figure Determine following. **10**
(i) IC
(ii) VCE
(iii) VB
(iv) VC

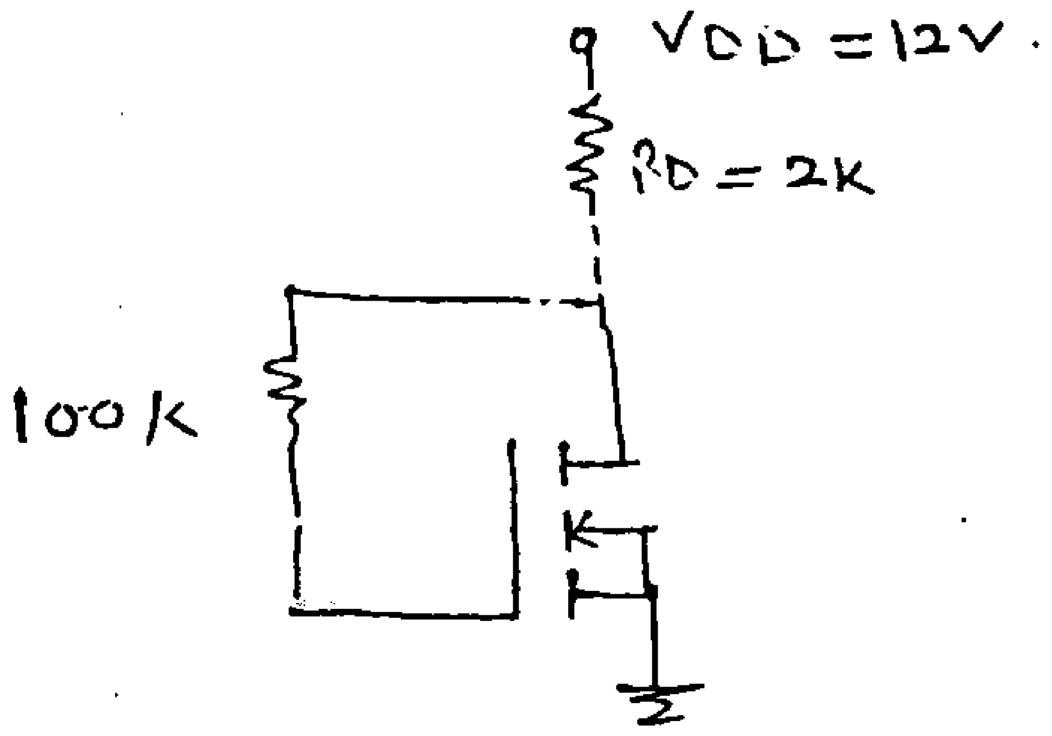


(b) Calculate the voltage gain and output resistance of the following circuit. Given that gm = 2mA/v & rd = 50k. **10**



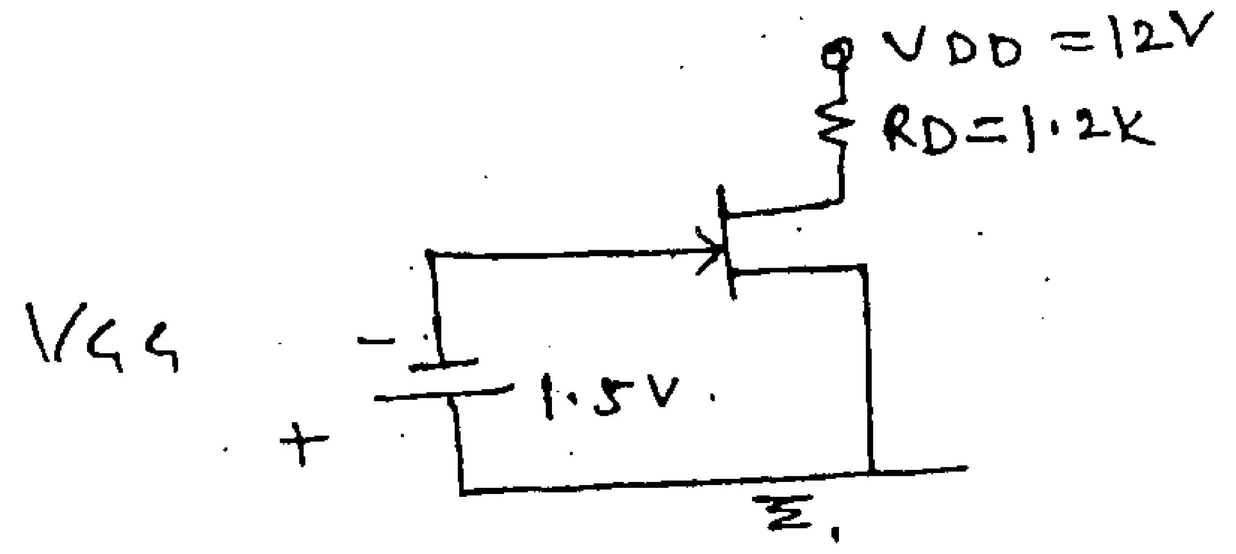
5. (a) Draw circuit diagram for half wave rectifier with capacitor filter with load resistor RL. **10**
Explain the working by drawing appropriate waveforms derive the expression for the ripple factor 'r'. **10**
(b) The following parameters are obtained from certain JFET data sheet VGs off = -8V & IDss = 6mA. Determine the values of ID for each value of VGS ranging from 0V to - 8V in 1V steps, plot the transfer characteristics for same data.

6. (a) ID (ON) = 6mA **10**
VGS (ON) = 8V
VGS (Th) = 3V
Determine
(i) IDQ
(ii) VDSQ



(b) Explain any two **10**
(i) UJT construction, characteristics & parameters.
(ii) SCR working & applications.
(iii) BJT as a switch
(iv)Power MOSFET

7. (a) Explain the working of UJT relaxation oscillator and draw waveform. **10**
(b) Determine drain current ID & VDS for fixed bias JFET cicuit. **10**



IDSS - 12mA
Vp = - 4v

Transistor type	$P_{d max}$ @ 25°C Watts	$I_{C max}$ @ 25°C Amps.	$V_{CE(sat)}$ volts d.c.	V_{CBO} volts d.c.	V_{CEO} (Sus) volts d.c.	V_{CER} (Sus) volts d.c.	V_{CEX} volts d.c.	V_{EBO} volts d.c.	T_j max. °C	D.C. min	current typ.	gain max.	Small min.	Signal typ.	h_{fe} max.	V_{BE} max.	θ_{jc} °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	3.5	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	–	[illegible]	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	[illegible]	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	[illegible]	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	[illegible]	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_{mo} (typical)	$-V_p$ Volts	r_d	Derating above 25°C	θ_{ja}
2N3822	50	50	50	300 mW	175°C	2 mA	3000 μ mho	6	50 KΩ	2 mW/°C	0.59°C/mW
BFW 11 (typical)	30	30	30	300 mW	200°C	7 mA	5600 μ mho	2.5	50 KΩ	—	0.59°C/mW

SE. SEm III (old) - EXTC 26 May 2015

D. L. D.

QP Code : **4683**

(OLD COURSE)

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

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

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

(3) **Each** question carries **20** marks. **Equal** marks for the subquestions.

(4) Assume **suitable** data if **required**.

1. (a) Perform the following operations –

(i) $(1101 \cdot 0)_2 \times (110.1)_2$

(ii) $(57)_8 - (47)_8$

(iii) $(75)_{10} - (55)_{10}$ using 2's complement method.

(iv) $(111010 \cdot 110)_2 \div (1010)_2$

(b) (i) Explain minterm and Maxterm

(ii) Justify, NAND & NOR gates are Universal gates.

(iii) Find M if $(193)_M = (623)_8$

(iv) Differentiate between synchronous and Asynchronous counter.

2. (a) Prove the following using boolean algebraic theorems

(i) $\overline{(\overline{AB} + \overline{A} + AB)} = 0$

(ii) $AB + \overline{AC} + A\overline{B}C\,(AB + C) = 1$

(b) State and prove DeMorgan's theorems.

3. (a) Simplity the following boolean function by using Quine Mc Cluskey method.

$F(A,B,C,D) = \Sigma m\,(0, 2, 3, 6, 7, 8, 10, 12, 13)$

(b) Minimize the following logical equation using K-map and design the minimized equation using logic gates.

$F(A,B,C,D) = \Pi M\,(0, 2, 3, 8, 9, 12, 13, 15)$

4. (a) Design the logic ckt for 1-bit comparator using NAND gates only.

(b) Draw and explain the working of clocked S-R Flip Flop with preset and clear using NAND gates only.

5. (a) Design the logic ckt for Mod-6 Ripple counter using MS-JK FFs.
   (b) Design the logic ckt for 3-bit SIPO Register using MS-D-FFs.

6. (a) Design the logic ckt for Full Subtractor using 3:8 Decoder.
   (b) Design and implement the given logical equation using 16:1 Multiplexer.

$$Y = \Sigma m\,(1, 3, 4, 8, 10, 11, 12, 14, 15)$$

7. (a) Explain TTL and ECL Logic Families.
   (b) Explain PAL and PLA.

S.E. Sem 3 (old) (Electrical) (EXTC) Branch 5/6/15

NT.

QP Code : 4559

(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 $\bar{a}$ = 123.41

ii) b = 0.0053102500 $\bar{b}$ = 0.0051

iii) c = 450550 $\bar{c}$ = 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.
$27x + 6y - z = 85$, $6x + 15y + 2z = 72$, $x + y + 54z = 110$. 10

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

[TURN OVER

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 3/8th 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 $\frac{dy}{dx} = x - y^2$ at $y(0.8)$, given values 10

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

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Sem III (Old) (EXTC)

Electrical Networks 11/6/2018

QP Code : 4689

(OLD COURSE) **QP Code:**

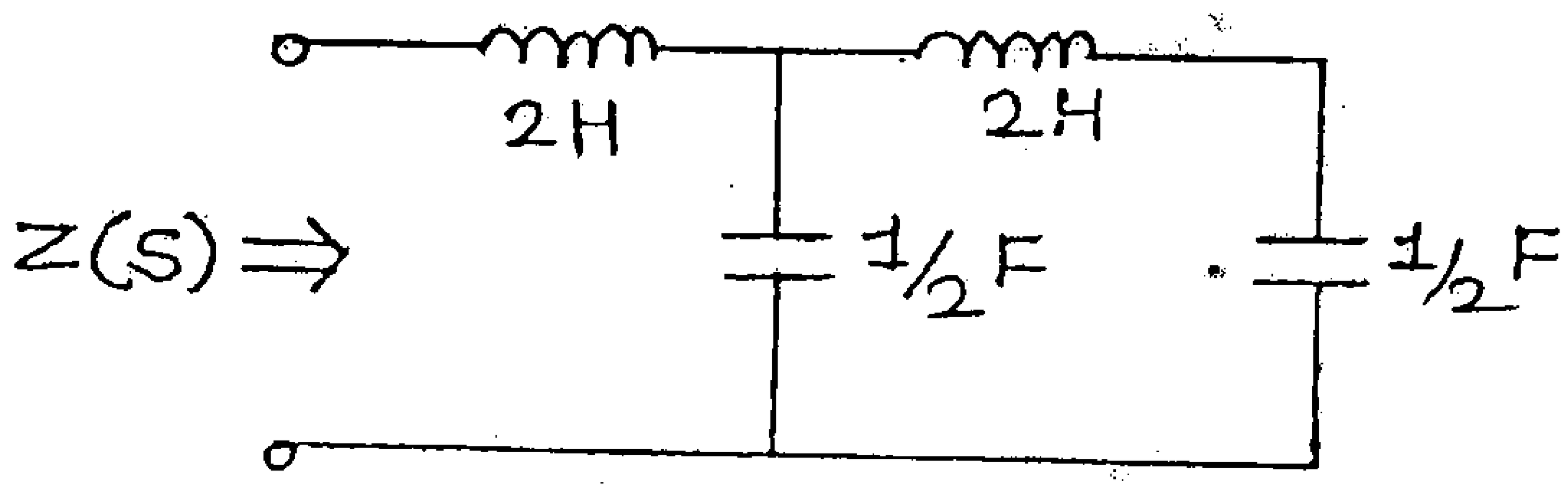
(3 Hours) [Total Marks:100]

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

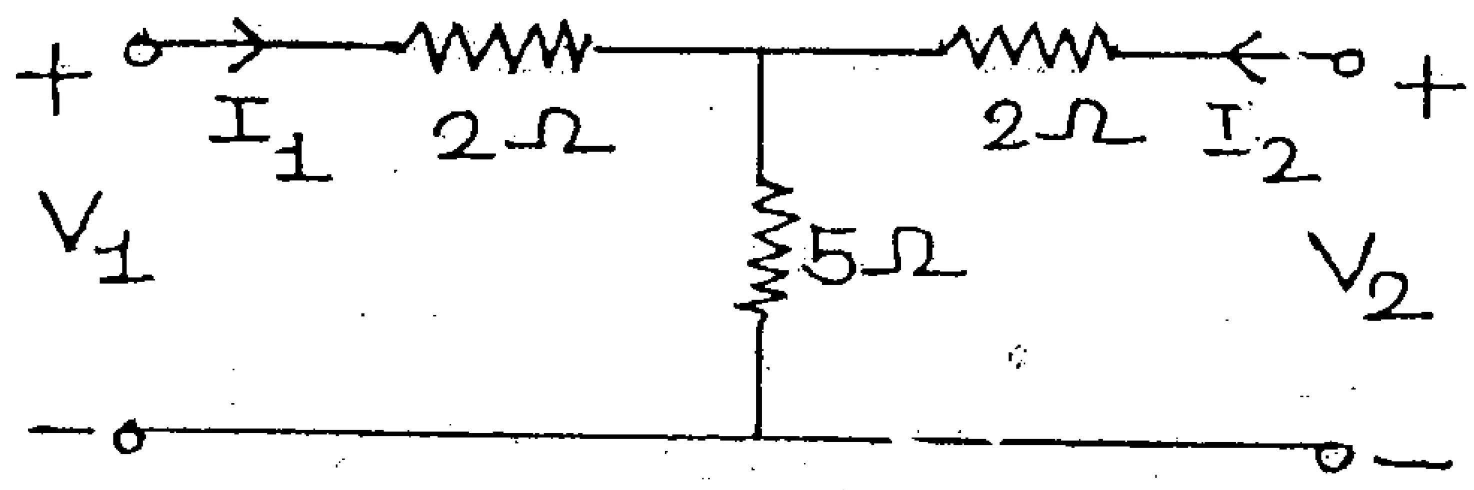
(2) Attempt any **four** from the **remaining** questions.

(3) **Assume** suitable **data, if required.**

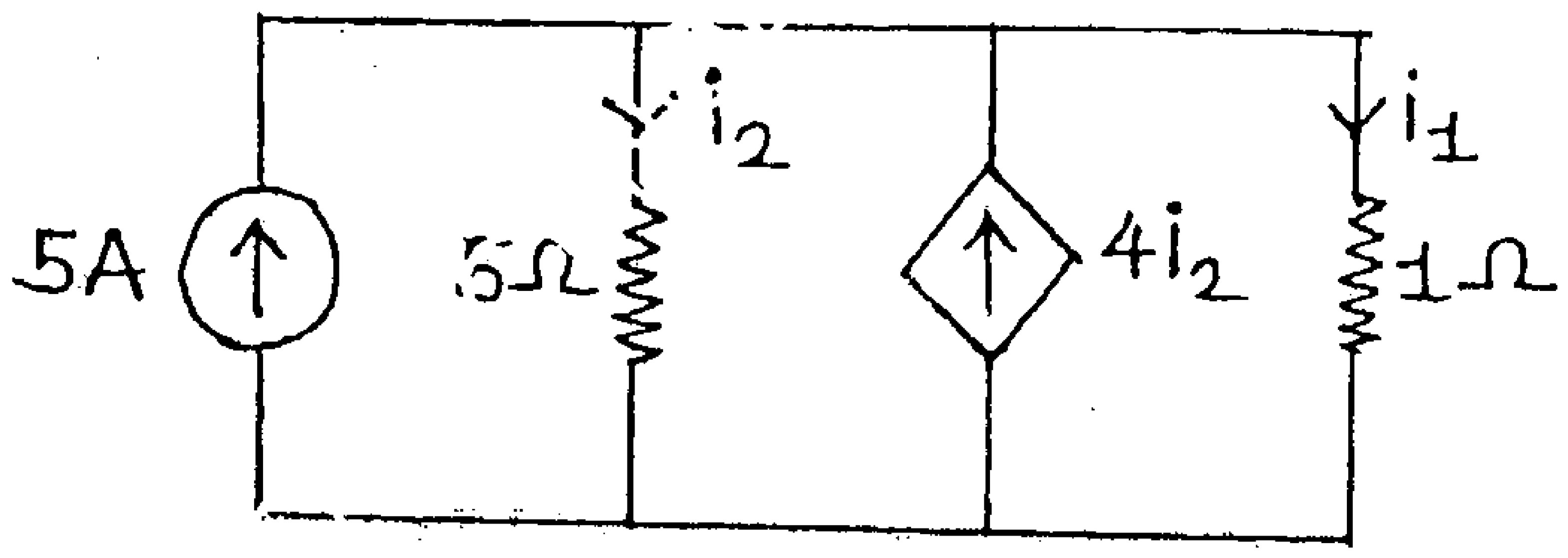
1.(a) Find the driving point impedance of network. 5



(b) For the given network find out z parameters and verify the condition of reciprocity. 5



(c) Find current i1 and i2 in the given circuit. 5



(d) Check for Hurwitz $P(s) = s^4 + 3s^2 + 2$. 5

RJ-Con. : 12541-15.

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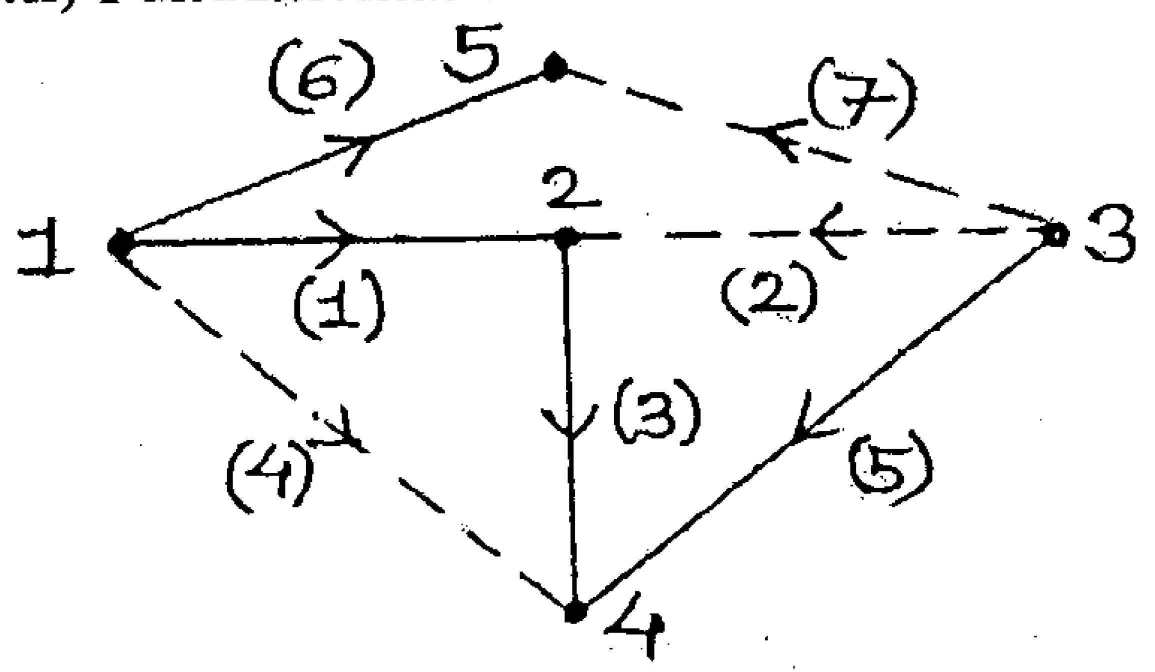
2.(a) For the given tree (shown with firm lines) obtain. 10

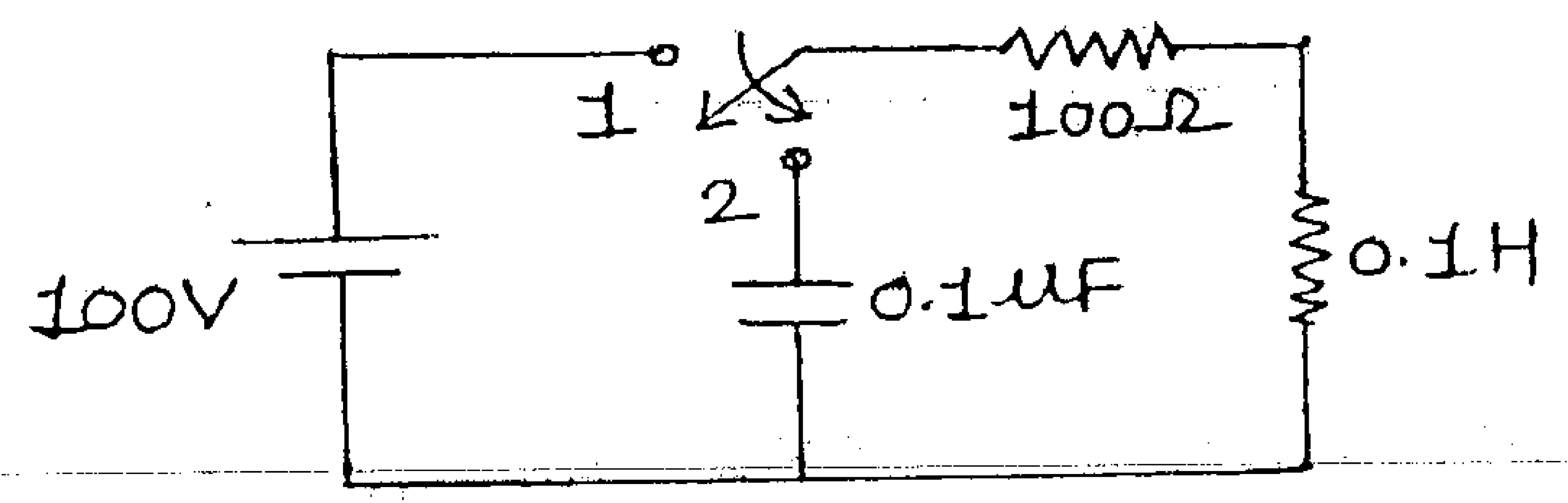
(i) Incidence matrix

(ii) Fundamental cutset matrix

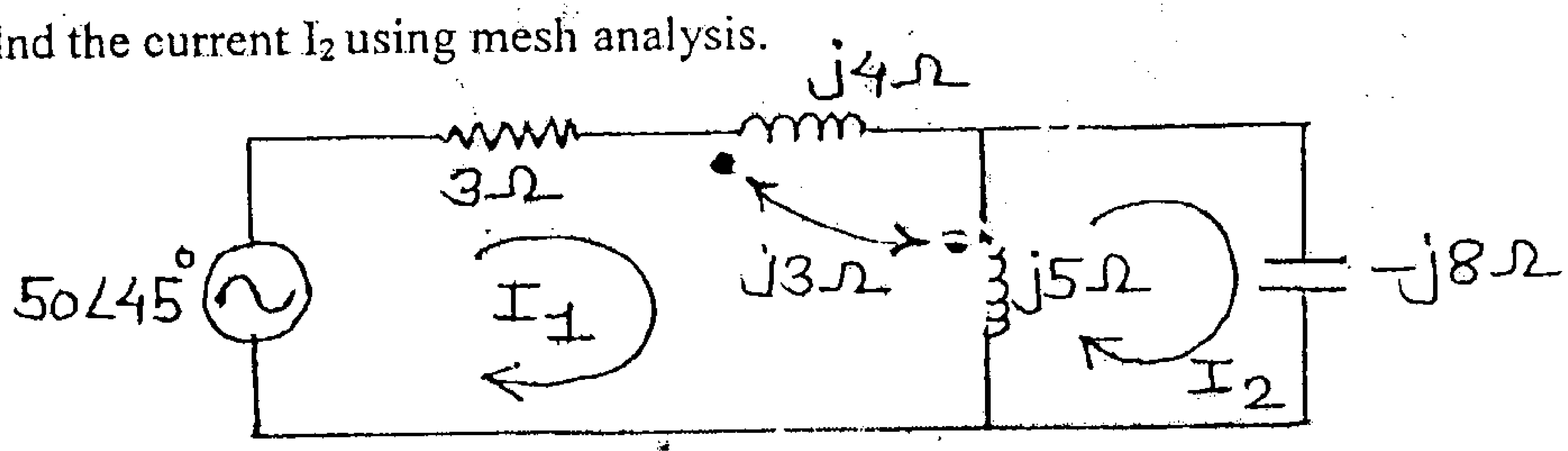
(iii) Fundamental tieset matrix.



(b) For the given the given network, the switch is changed from position1 to 2 at time $t=0$. Find i, $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at $t=0^+$. Assume that steady-state is reached at switch position 1. 10



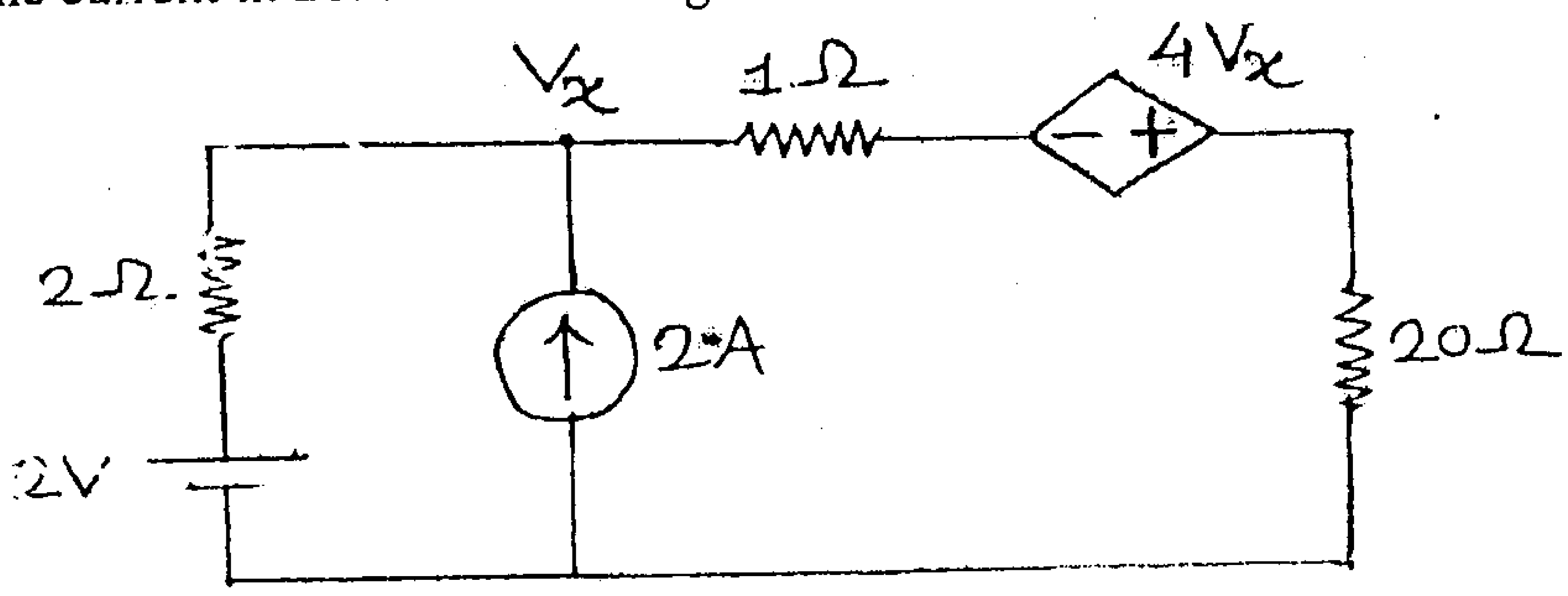
3.(a) Find the current I_2 using mesh analysis. 10



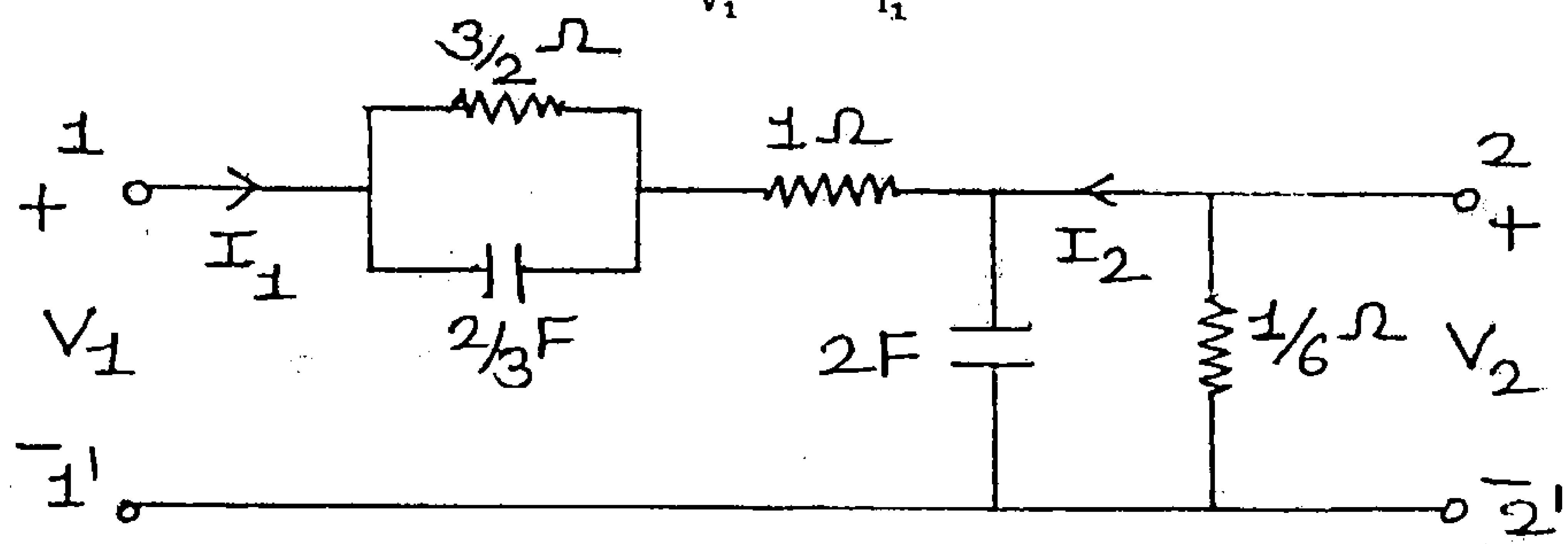
(b) Realize using Foster-I and Foster-II form. 10

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

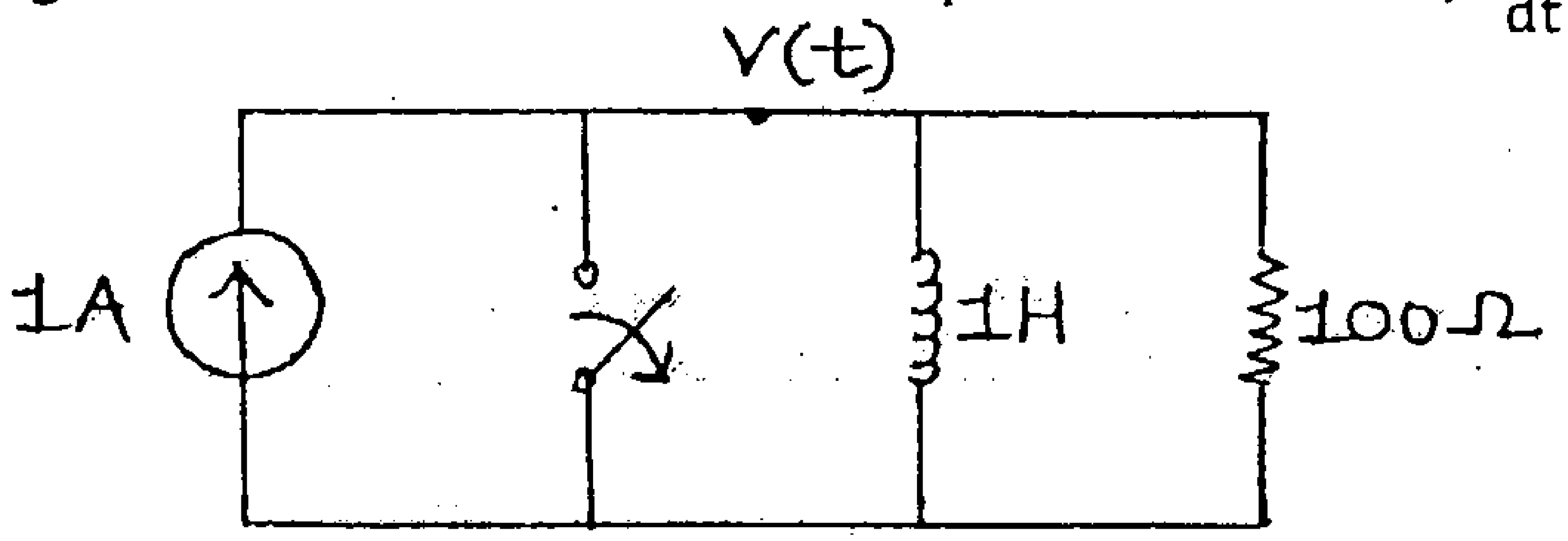
4.(a) Find the current in 20Ω resistor using Thevenin's theorem. 10



(b) For the given network, find out $\frac{V_2}{V_1}$ and $\frac{I_2}{I_1}$. 10



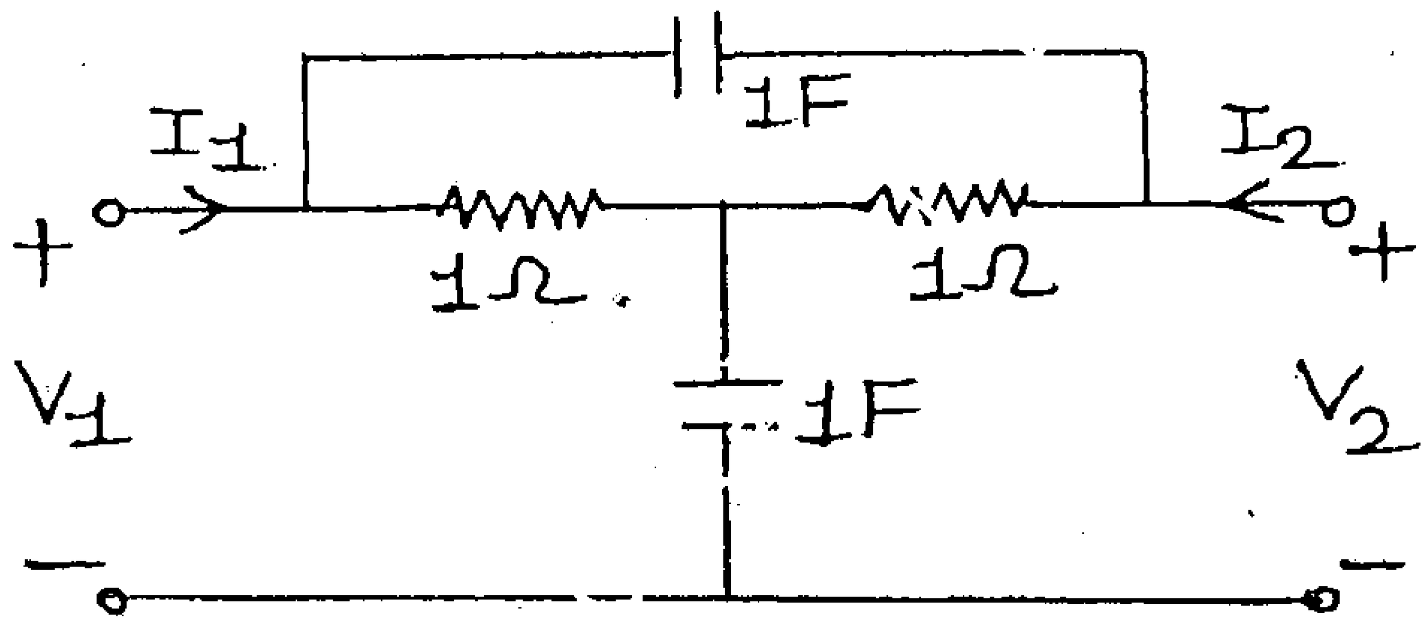
5.(a) For the given network at t = 0, switch is opened. Calculate v, $\frac{dv}{dt}$, $\frac{d^2v}{dt^2}$ at t=0$^+$. 10



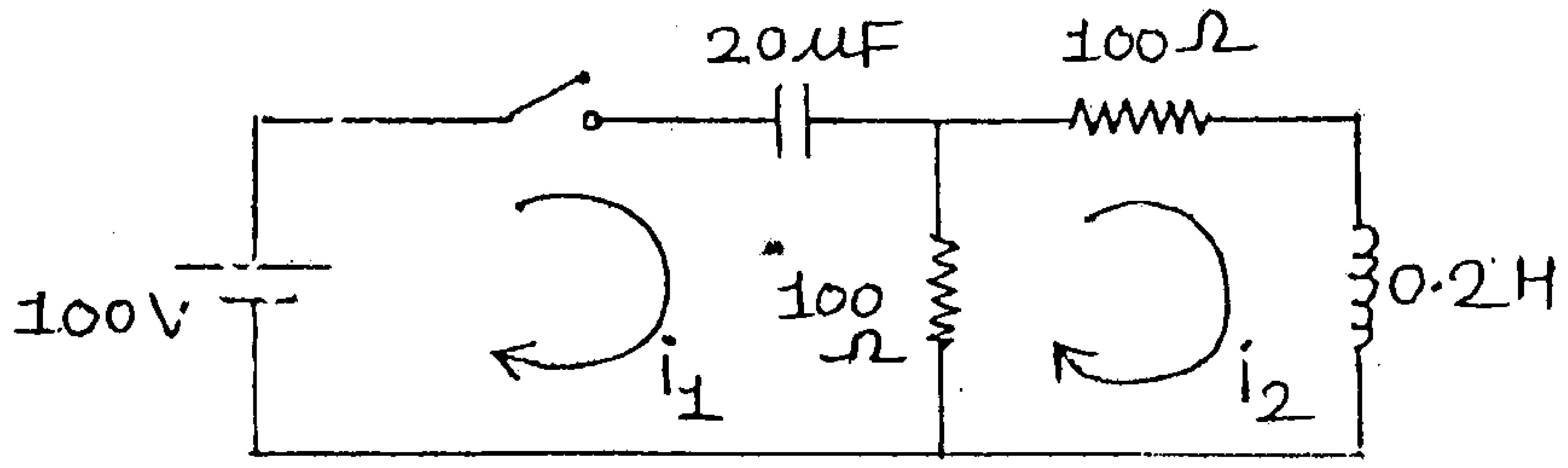
(b) Check the positive realness of the following functions: 10

(i) $\frac{(s^2+s+6)}{(s^2+s+1)}$ (ii) $\frac{(s^2+1)}{(s^3+4s)}$

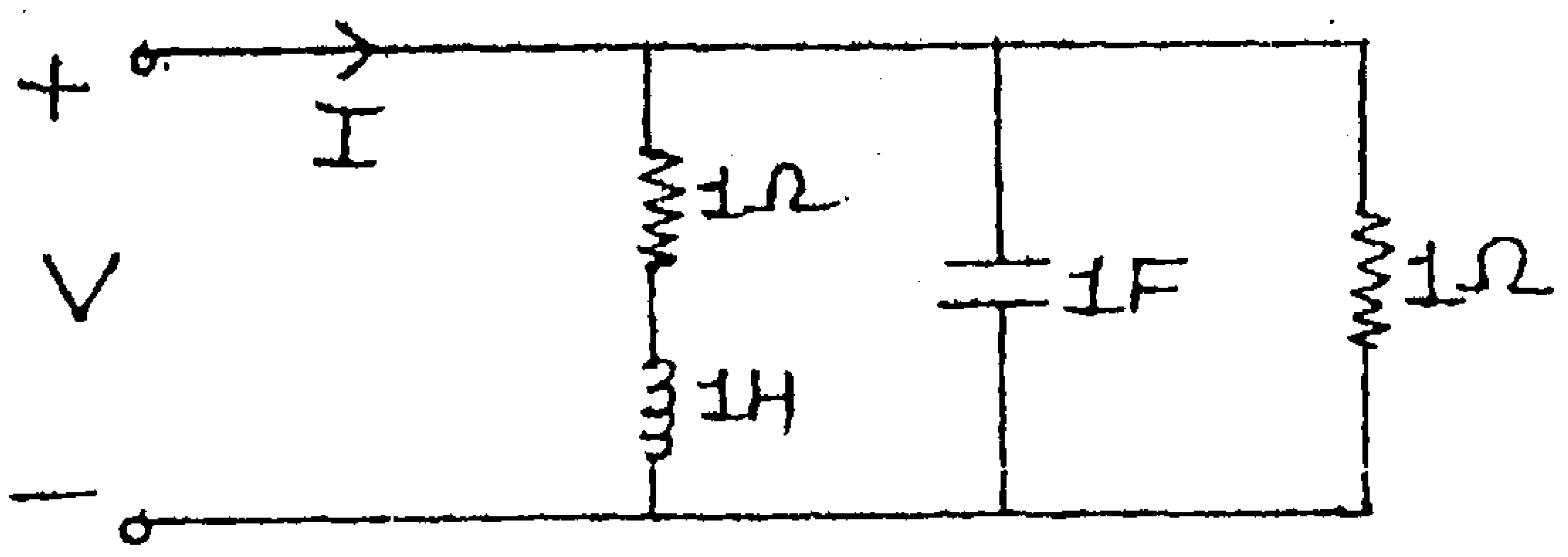
6.(a) Find y parameters for the given network. 10



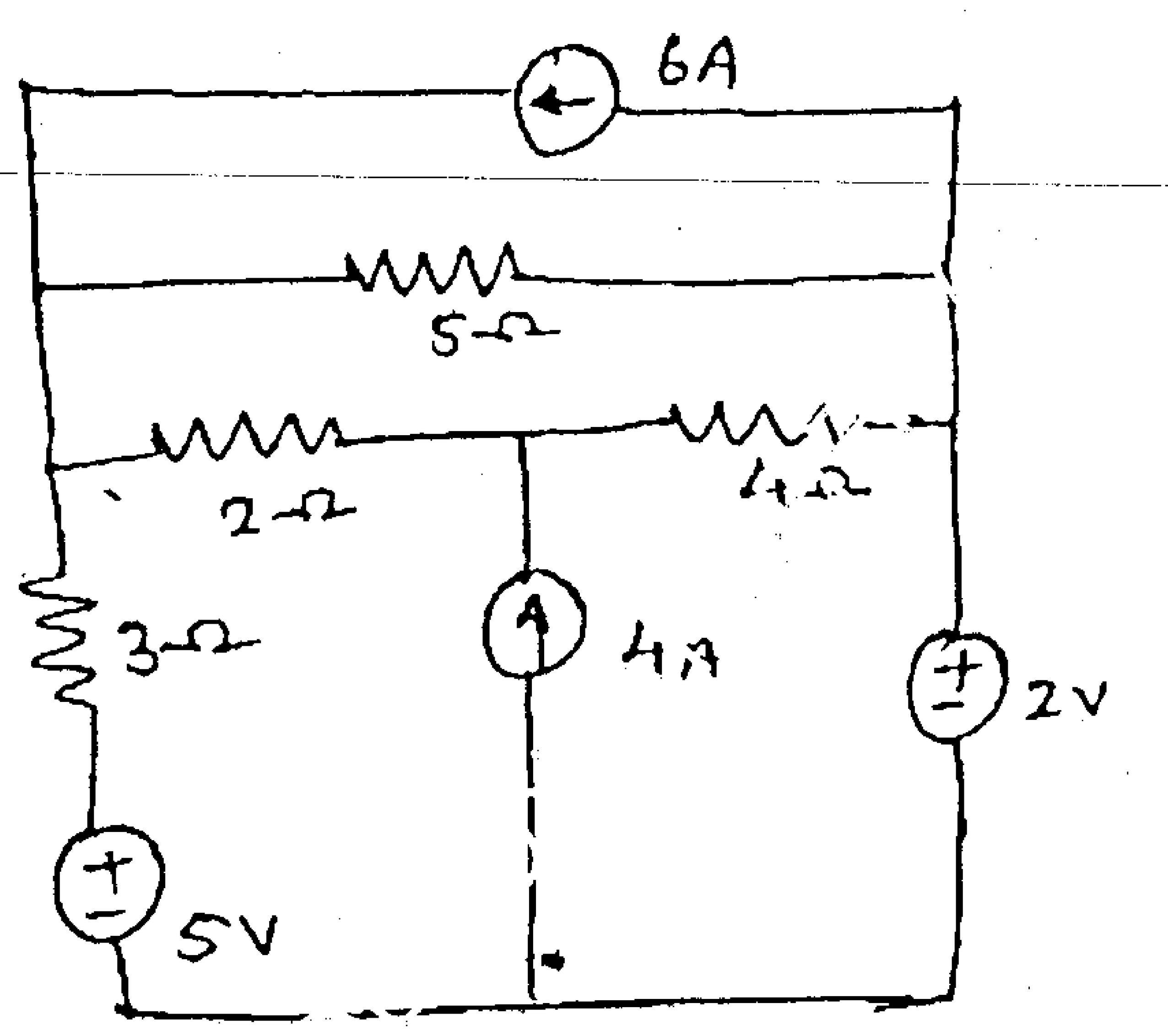
(b) For the network, calculate i_1, i_2, $\frac{di_1}{dt}$, $\frac{di_2}{dt}$, $\frac{d^2i_1}{dt^2}$, $\frac{d^2i_2}{dt^2}$ at t=0+. Switch is closed at t = 0.Initially switch is open. 10



7. (a) Find the driving admittance Y(s) for the network shown below and plot the pole zero diagram. 10



(b) Using Nodal method find the current though 4Ω resistor. 10



S.E. EXTC (III) (OTR) · 14/5/15
App. Maths - III

(OLD COURSE)

Q.P. Code : 4677

(3 Hours) [Total Marks : 100

N.B. : (1) Question No. **1** is **compulsory.**
(2) Attempt any **four** questions from question no. **2** to 7.
(3) **All** sub questions of any question must be answered togethter.

1. (a) Find L [Sin t Sin 3t sin 5t] 5

(b) Find z transformation of $\frac{a^k}{k}$, $k \geq 1$ 5

(c) Show that every square matrix A can be uniquely expressed sum of hermitian matrix and skew-hermitian matrix. 5

(c) Find the fourier series of $f(x)=\left(\frac{\pi-x}{2}\right)^2$ in the interval $0 \leq x \leq 2\pi$ 5

2. (a) Show that $\int_0^\infty \frac{(\sin 2t+\sin 3t)}{te^t}\,dt = \frac{3\pi}{4}$ 6

(b) Show that $A=\frac{1}{2}\begin{bmatrix} \sqrt{2} & -i\sqrt{2} & 0 \\ +i\sqrt{2} & -\sqrt{2} & 0 \\ 0 & 0 & 2 \end{bmatrix}$ is unitary hence find A^{-1}. 6

(c) Find the Fourier Expansion for $f(x)=\sqrt{1-\cos x}$ in $(0, 2\pi)$, hence deduce 8

$$\sum_1^\infty \frac{1}{4n^2-1}=\frac{1}{2}$$

3. (a) Solve $(D^2+2D+5)\,y = e^{-t}\sin t$ given y (0) = 0, y (0) 6

(b) Find the Fourier series of 6

$f(x) = \cos x \quad -\pi < x < 0$
$\quad\quad \sin x \quad 0 < x < \pi$

(c) Solve the equations by Gauss seidel method 8

$23x + 4y - z = 32$
$2x + 17y + 4z = 35$
$x + 3y + 10z = 24$

[TURN OVER

4\. (a) P.T. $f_1(x) = 1,\ f_2(x) = x,\ f_3(x) = \frac{3x^2 - 1}{2}$ 6

(b) Find the non-sigular matrices P and Q such that PAQ is normal. Where A is 6

given by $A = \begin{bmatrix} 1 & 2 & 3 \\ 3 & 2 & 1 \\ 1 & 2 & 3 \\ 2 & 1 & 3 \end{bmatrix}$

(c) Find the inverse Laplace Transformation 8

(i) $L^{-1}\left[\log\left(\frac{S^2 + 16}{S^2 + 25}\right)\right]$ (ii) $L^{-1}\left[\frac{S + 4}{(S+1)^2\ (S - 1)}\right]$

5\. (a) Find the inverse Z - Transformation $f(z) = \frac{1}{(z - 3)(z - 2)}$ 6

(b) Find the fourier series 3

$f(x) = 2x - x^2 \qquad 0 \le x \le 3$

(c) Investigate for what values of λ, μ the equation $x + y + z = 6$, $x + 2y + 3z = 10$ 8

$x + 2y + \lambda z = \mu$ have

(i) no solution (ii) unique solution (iii) infinite number of solution

6\. (a) Find z transformation of $Z[\, a\cos k\alpha + b\sin k\alpha]\ k \ge 0$ 6

(b) Find the complex form of Fourier series $f(x) = \cos h\, a x + \sin h\, a x$ in $[-\pi, \pi]$ 6

(c) Find the Laplace Transformation of 8

(i) $L\left[\frac{d}{dt}\left(\frac{1 - \cos 2t}{t}\right)\right]$ (ii) $L[t \sin^3 t]$

7\. (a) Find the Laplace transformation of 6

$f(t) = E \quad 0 \le t \le a$

$= -E \quad 0 \le t \le 2a$, $f(t) = f(t + 2a)$

(b) Obtain half range cos series 6

$f(x) = x(\pi - x) \quad 0 \le x \le \pi$ and hence deduce $\sum_{1}^{\infty} \frac{1}{n^4} = \frac{\pi^4}{90}$