S.E (sem III) old ETRX
Control system

CG 1/2/13

Con. 5580-13. **(OLD COURSE)** **LJ-10391**

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

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

1. Answer any **five**:– **20**

(a) How to find gain margin and phase margin from Bode Plot.

(b) Compare open and closed loop control systems and give examples.

(c) Compare the two stability methods:–
(i) Root Locus (ii) Routh's Criterion.

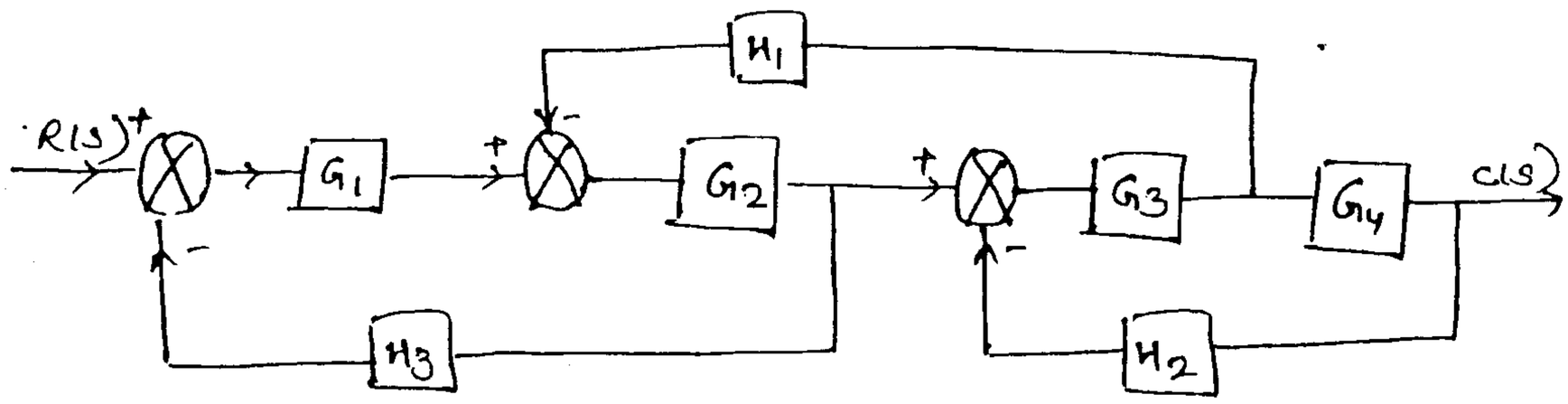
(d) Draw the step responses of a standard second order undamped, underdamped and critically damped system. Also show pole locations of these systems.

(e) Define 'Type' and 'Order' of the system. Hence determine 'Type' and 'Order' of a control system with

$$G(s) = \frac{5(S+1)}{S(S+5)(S+4)} \text{ and } H(s) = 1$$

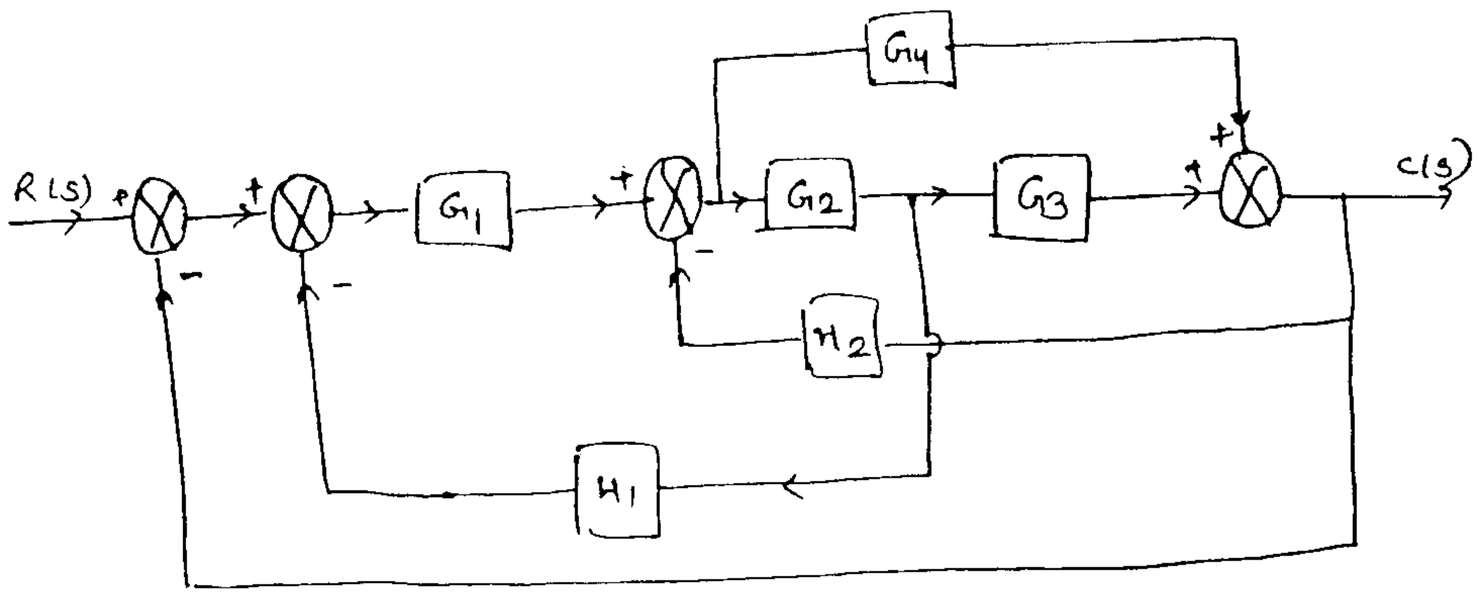
(f) Explain Hurwitz Stability Criterion. What are its disadvantages?

2. (a) Find the transfer function $\frac{C(s)}{R(s)}$ using Block diagram Reduction Technique– **10**



(b) Derive the expression for output response of standard second order underdamped system. **10**

3. (a) Consider the following block diagram shown. Draw its equivalent signal flow graph and find the transfer function $\frac{C(s)}{R(s)}$ using Mason's gain rule. **10**



Con. 5580-LJ-10391-13.

(b) Find all the error coefficients for unity feedback systems having transfer function as **10**

$$\text{(a) } G(s)=\frac{14(S+3)}{S(S+5)(S^2+2S+2)} \quad \text{(b) } G(s)=\frac{26}{S^2(S-1)(S^2+6S+13)}$$

Calculate the 'Type' of the system in each case.

4. (a) Using Routh's Stability Criterion, determine the number of roots on imaginary axis for the system $S^6 + 4\,S^5 + 3S^4 - 16S^2 - 64S - 48 = 0$ **10**

and comment on stability of given system.

(b) Sketch the root locus for the system having **10**

$$G(s).H(s) = \frac{K(s+0.5)}{S(S^2+2S+2)}$$

Also determine 'k' for damping ratio of 0.5 from the root locus.

5. (a) Sketch the Bode plot for system **10**

$$G(s).H(s)=\frac{242(S+5)}{S(S+1)\,(S^2+5S+121)}$$

Comment on system stability.

(b) Sketch the polar plot for the system having transfer function $G(s) = \frac{1}{S(1+S)^2}$ **10**

6. (a) Sketch the Nyquist plot for $G(S).H(s) = \frac{50}{(S+1)\,(S+2)}$ **10**

and comment on the closed loop stability of the system.

(b) Derive the transfer function of a armature controlled DC servomotor and obtian the resulting block diagram. **10**

7. Write short notes on following:– **20**

(a) Synchros

(b) Co-relation between time domain and frequency Domain specifications.

(c) Pl and PD controllers.

SE Sem III (Old) EN Ags 20/12/13

(ETRX)

Con. 5592-13. **LJ-10421**

(OLD COURSE)

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

N.B. :(1) Question No. **1** is **compulsory**.
(2) Attempt any **four** questions from the remaining **six** questions.
(3) Assume suitable **data** wherever required but **justify** the same.

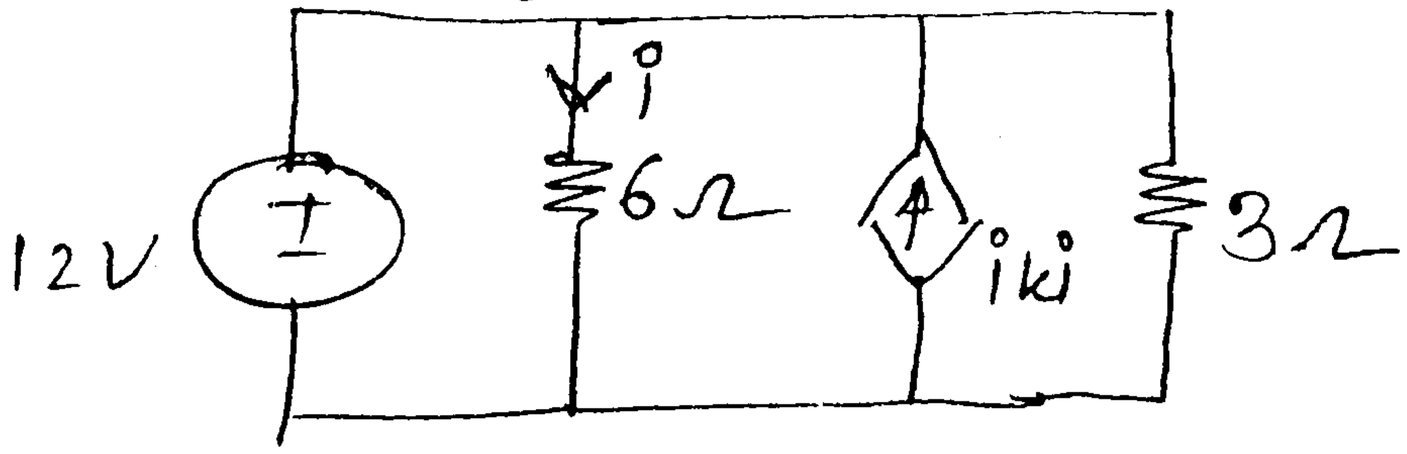
1. (a) State properties of Hurwitz polynomial. **5**

(b) Express transmission parameters in terms of admittance parameters. **5**

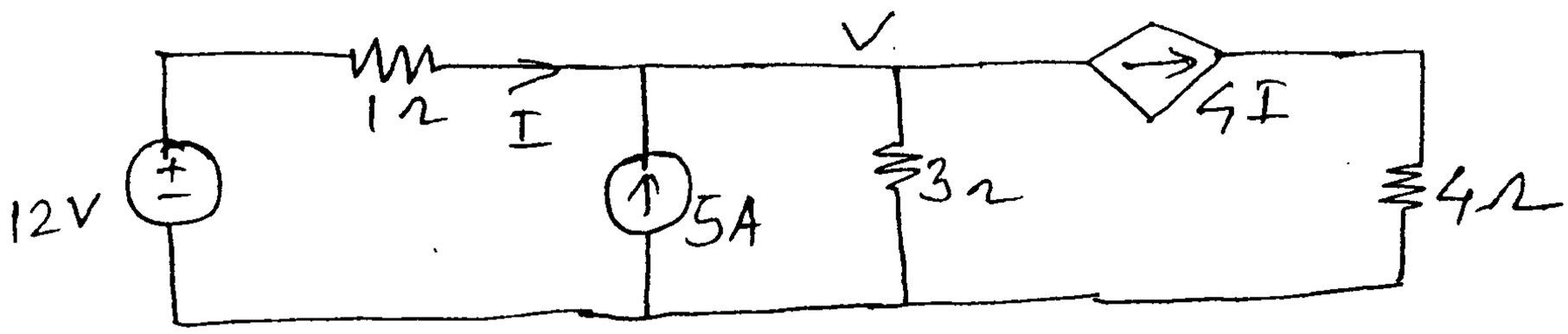
(c) Given the incidence matrix obtain the linear graph. :– **5**

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

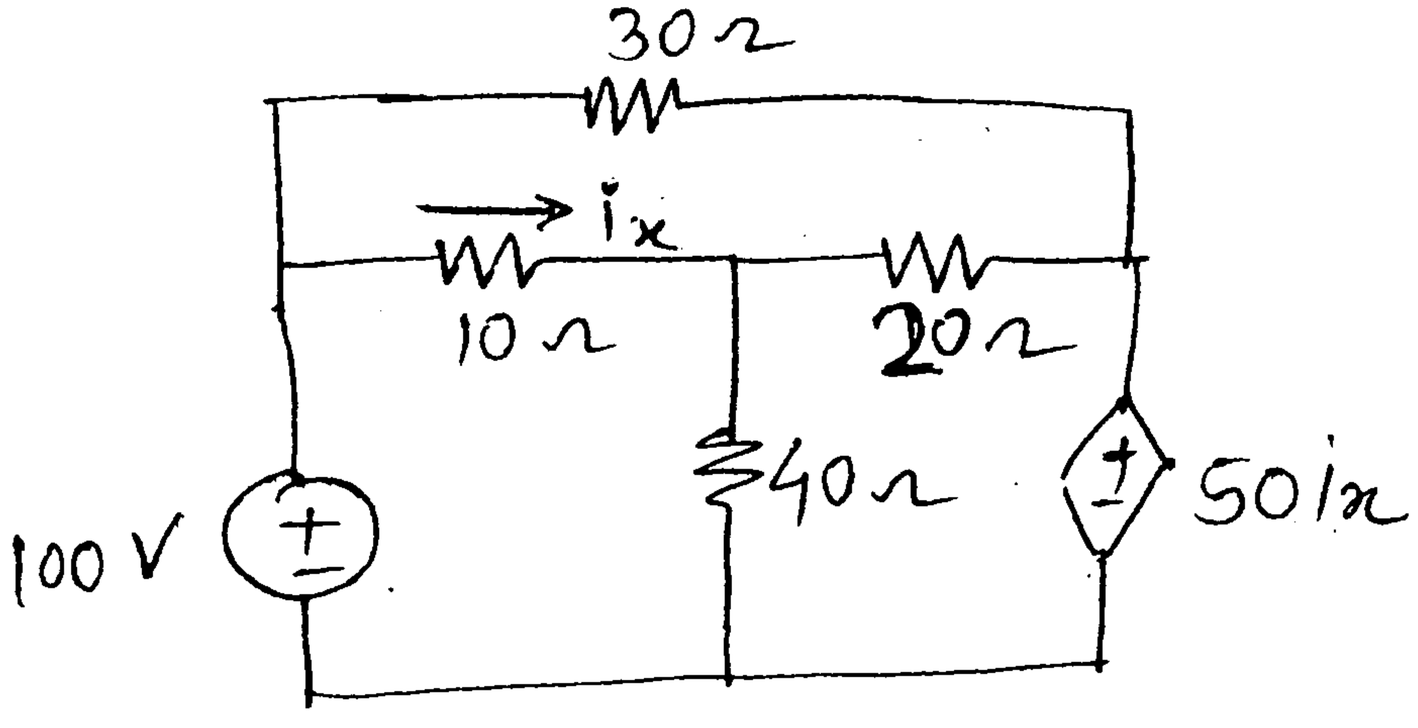
(d) Determine 'Ki' for the given network :– **5**



2. (a) Find current in the 4 ohm resistor of the circuit using superposition theorem :– **10**



(b) Find power associated with CCVS :– **10**



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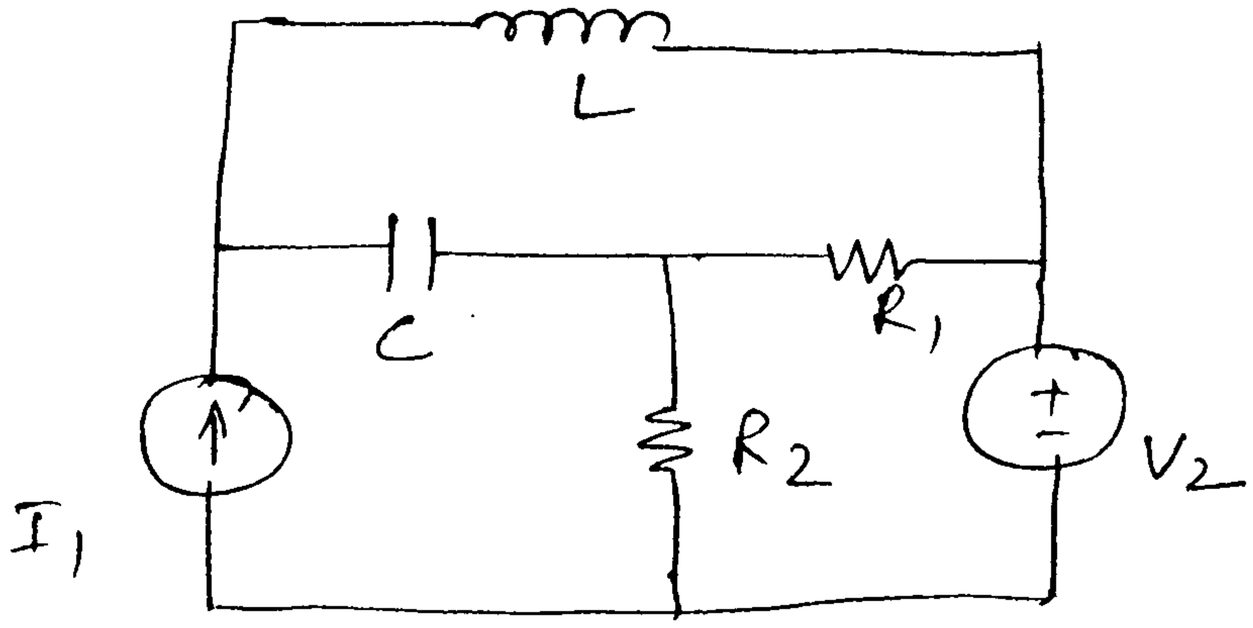
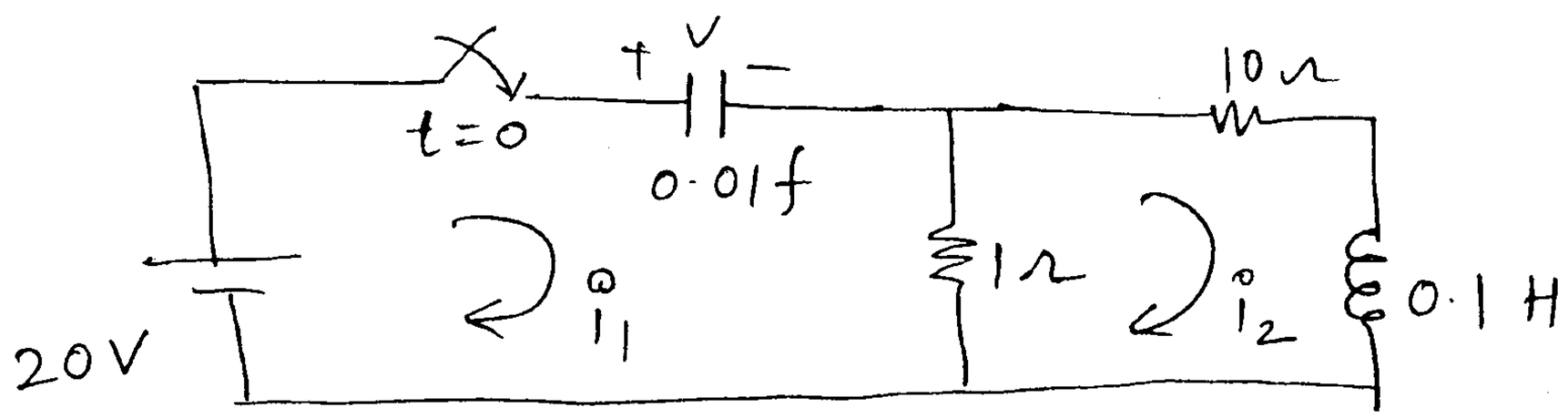
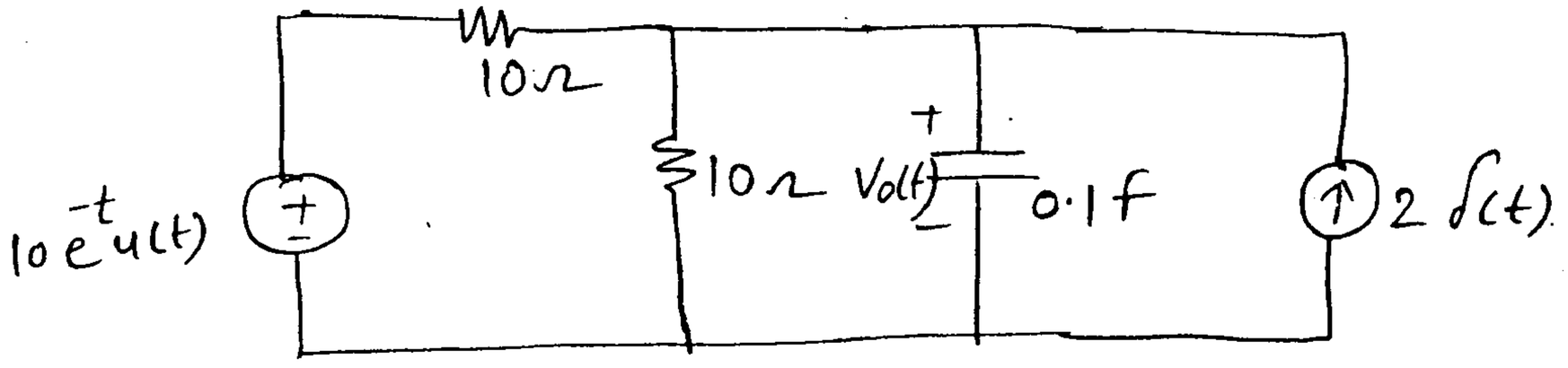
3. (a) Find Incidence matrix, cutset matrix, tieset matrix, for the network shown below. **10**



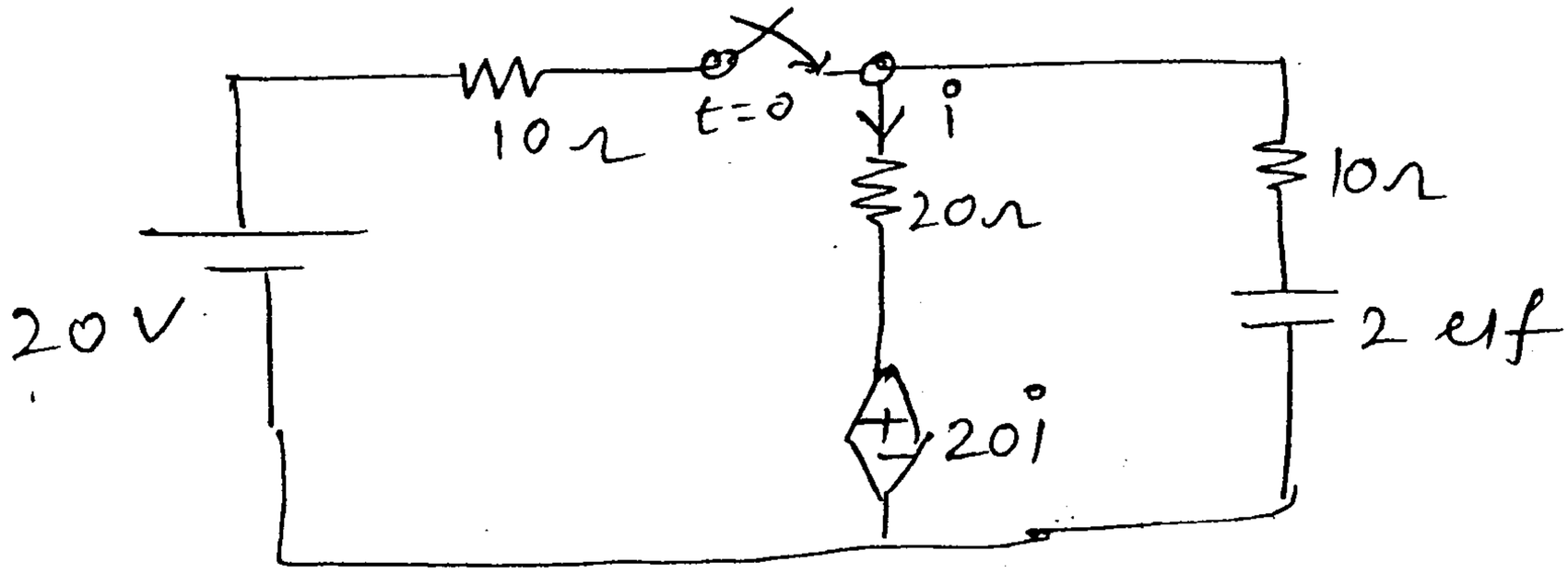
(b) Determine $i_1, i_2, \frac{di_1}{dt}, \frac{d^2i_1}{dt^2}, \frac{d^2i_2}{dt^2}$ at $t = 0^+$ in the circuit shown :– **10**



4. (a) Find Vo(t); Assume Vo(o) = oV :– **10**



(b) For the circuit shown find current equation when switch is opened at t = 0. **10**



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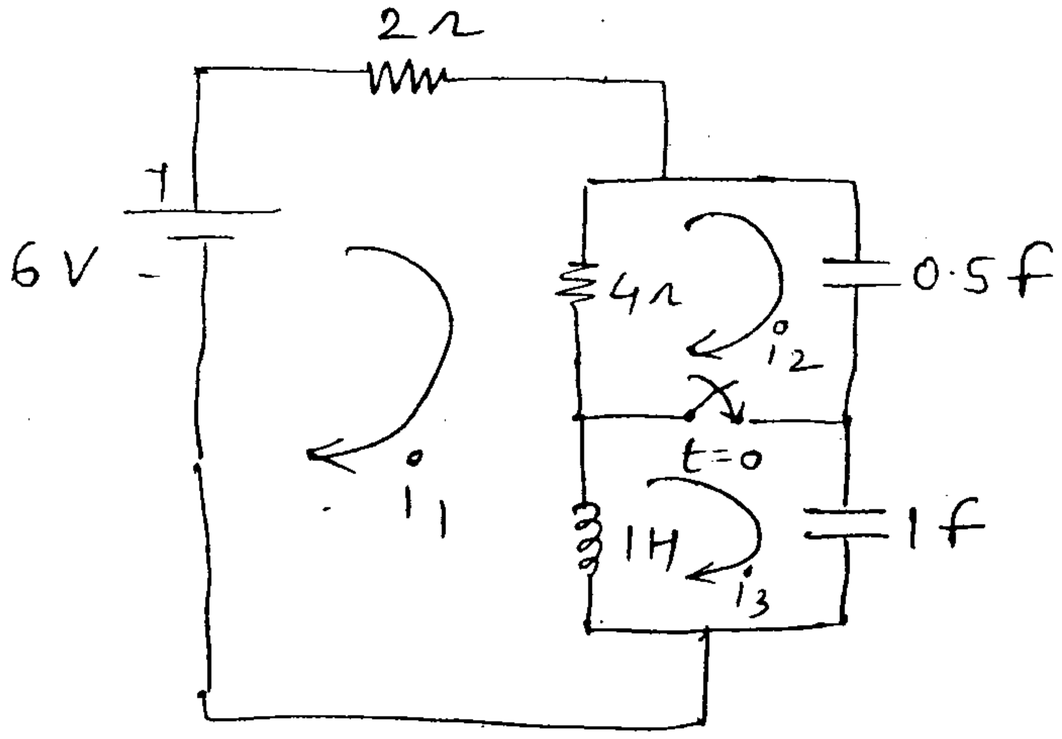
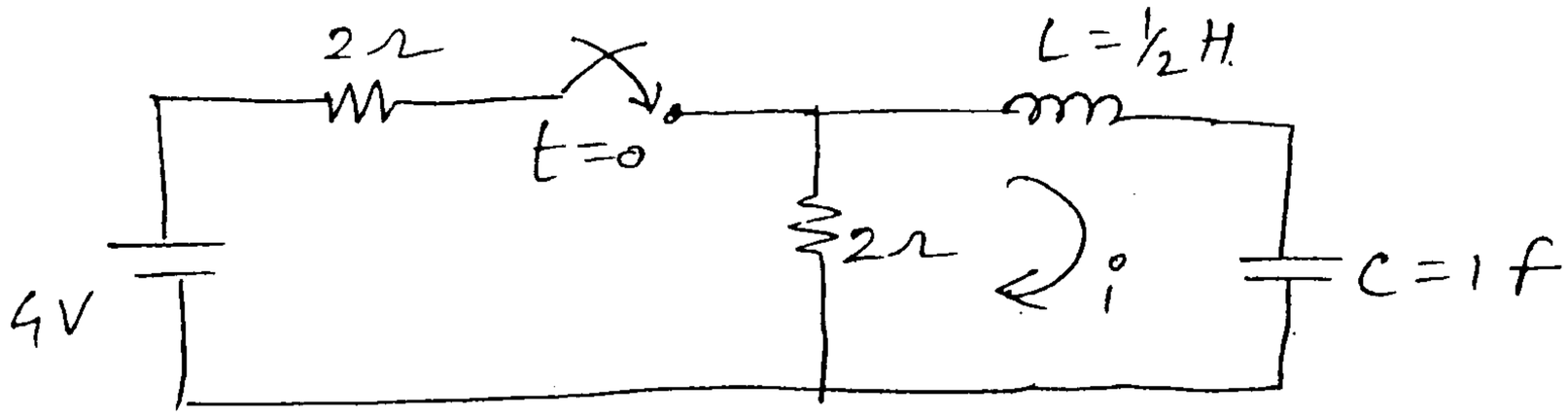
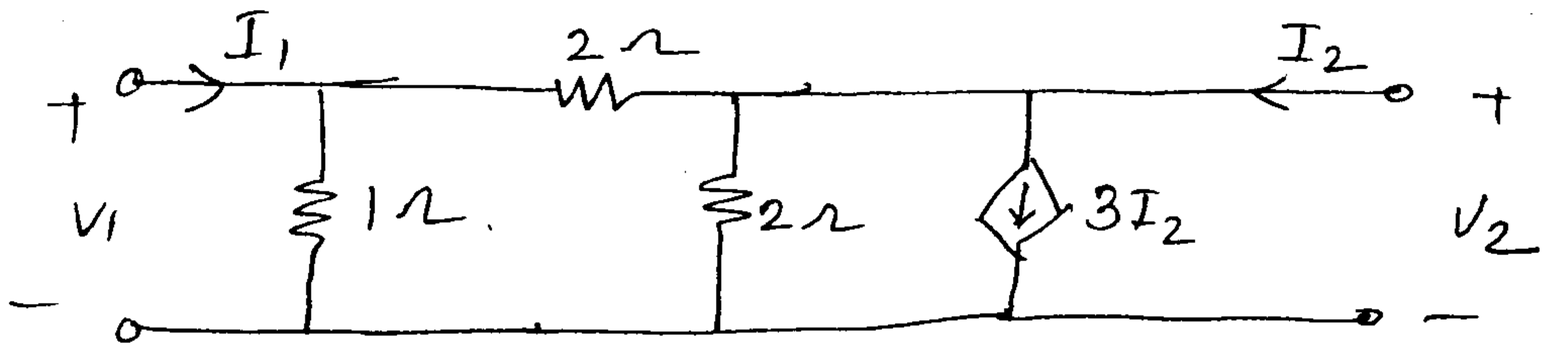
5. (a) Fine three loop currents at $t = 0^+$:– **10**



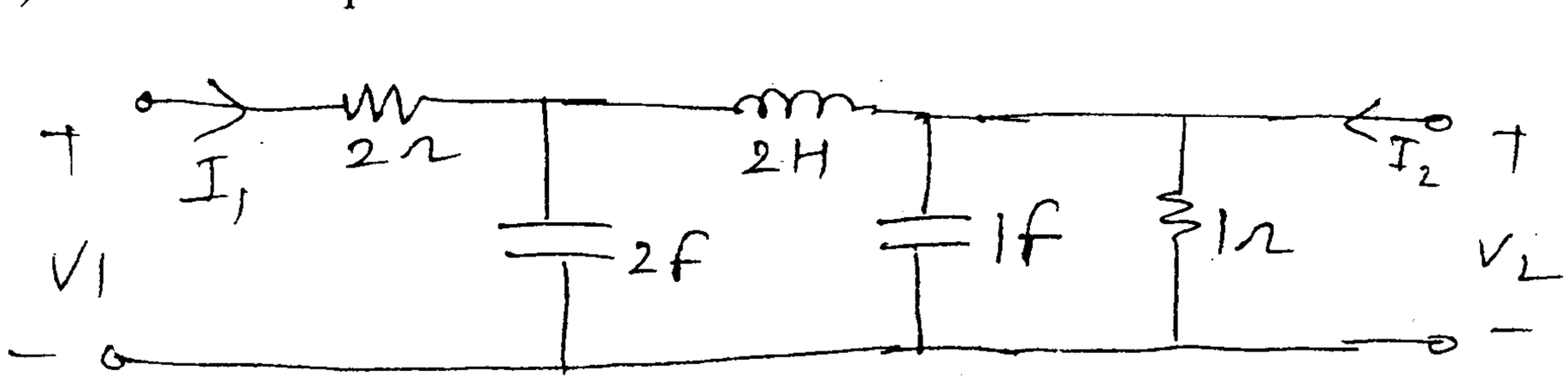
(b) Find i(t) for the circuit given using Classical method :– **10**



6. (a) Find Z and Y parameters :– **10**



(b) Find ABCD parameter for the network shown :– **10**



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7. (a) Realise the function in Foster–I and Foster–II forms :– **10**

$$Y(S)=\frac{S(S+2)(S+6)}{(S+1)(S+4)(S+8)}$$

(b) Synthesize the function in Cauer–I and Cauer–II forms :– **10**

$$Z(S)=\frac{S^3+2S}{S^4+2S^2+3}$$

ETRX

S.E. ETRX old sem III Nov-B
sub - EM-III

V-A4-II-Ex-13-E-38

Con. 6556-13.

LJ-10252

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

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

1. (a) Prove that following matrix is orthogonal and hence find A^{-1} where :— **5**

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

(b) Find $L\left[\sin\sqrt{t}\right]$ **5**

(c) Find the constants a, b, c, d if $f(z) = x^2 + 2axy + by^2 + i(cx^2 + 2dxy + y^2)$ **5**

(d) Obtain Half range cosine series for $f(x) = x(0, 2)$ Using parsveis identity deduce that : **5**

$$\frac{\pi^4}{96} = \frac{1}{1^4} + \frac{1}{3^4} + \frac{1}{5^4} \cdots$$

2. (a) Find $L\left\{\int_0^t u^{-1} e^{-u} \sin u \, du\right\}$ **6**

(b) Find the Fourier expansion of $f(n) = 4 - x^2$ in the interval $(0, 2)$. **6**

(c) Find two matrices Pand Q such that PAQ is in normal form where $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 0 \\ 0 & 1 & 2 \end{bmatrix}$ **8**

Hence find A^{-1} if it exist.

3. (a) Prove that the matrix $A = \frac{1}{2}\begin{bmatrix} 1+i & -1+i \\ 1+i & 1-i \end{bmatrix}$ is unitary. **6**

(b) Use Green's Theorm to evaluate $\int_0 (e^{-x} \sin y \, dx + e^{-x} \cos y \, dy)$ where C is the rectangel **6**

whose vertices are $(0, 0)$, $(\pi, 0)$ $(\pi, \pi/2)$, $(0, \pi/2)$.

(c) Use Laplace Transform to solve $(D^2 - D - 2)\, y = 1$ Where $y(0) = 1$, $y'(0) = 0$ **8**

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4. (a) If $\{f(k)\} = \{2^0, 2^1, 2^2, \ldots.\}$ find z $\{f(k)\}$. **6**

   (b) Find an analytic function whose Real part is $u = x^3 - 3xy^2 - 3x^2 - 3y^2 + 1$ **6**

   (c) Find the Fourier expansion of $f(x) = x + n^2$ When $-\pi \leq x \leq \pi$ and hence deduce that **8**

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

5. (a) If $V = e^x \sin y$ prove that V is a harmonic function. Also find the corresponding analytic function and harmonic conjugate. **6**

   (b) Find the finite Fourier sine transform of sinkx if k is not an integers and $0 < x < \pi$. **6**

   (c) Find : (i) $L^{-1}\{\tan^{-1}(a/s)\}$ (ii) $L^{-1}\dfrac{s^2 + 2s + 3}{(s^2 + 2s + 5)(s^2 + 2s + 2)}$. **8**

6. (a) Solve the equations $x + y + z = 3$, $x + 2y + 3z = 4$, $x + 4y + 9z = 6$ **6**

   (b) Obtain complex form of Fourier series for $f(x) = e^{ax}$ in $(-1, 1)$ **6**

   (c) Prove that $\overline{F} = (y^2 \cos x + z^3)\,i + (2y \sin x - 4)\,j + (3xz^2 + 2)\,k$ is conservative field. **8**
   Find (i) Scalar potential (ii) the work done in moving an object in this field from $(0, 1, -1)$ to $(\pi/2, -1, 2)$

7. (a) If $S = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}$ and $A = \frac{1}{2}\begin{bmatrix} 5 & 2 & 1 \\ 1 & 4 & -1 \\ -1 & -2 & 3 \end{bmatrix}$. Find SAS^{-1}. **6**

   (b) Evaluat using LT $\displaystyle\int_0^{\infty}\int_0^{t} \frac{e^{-t}\sin y}{u}\,du\,dt$. **6**

   (c) Find the bilinear transoformation, which maps $z = -1, 1, \infty$, on to the Points $w = -i, -1, i$. **8**

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S.E. III old. Electronics 29/11/13

Basic Electronic Circuits.

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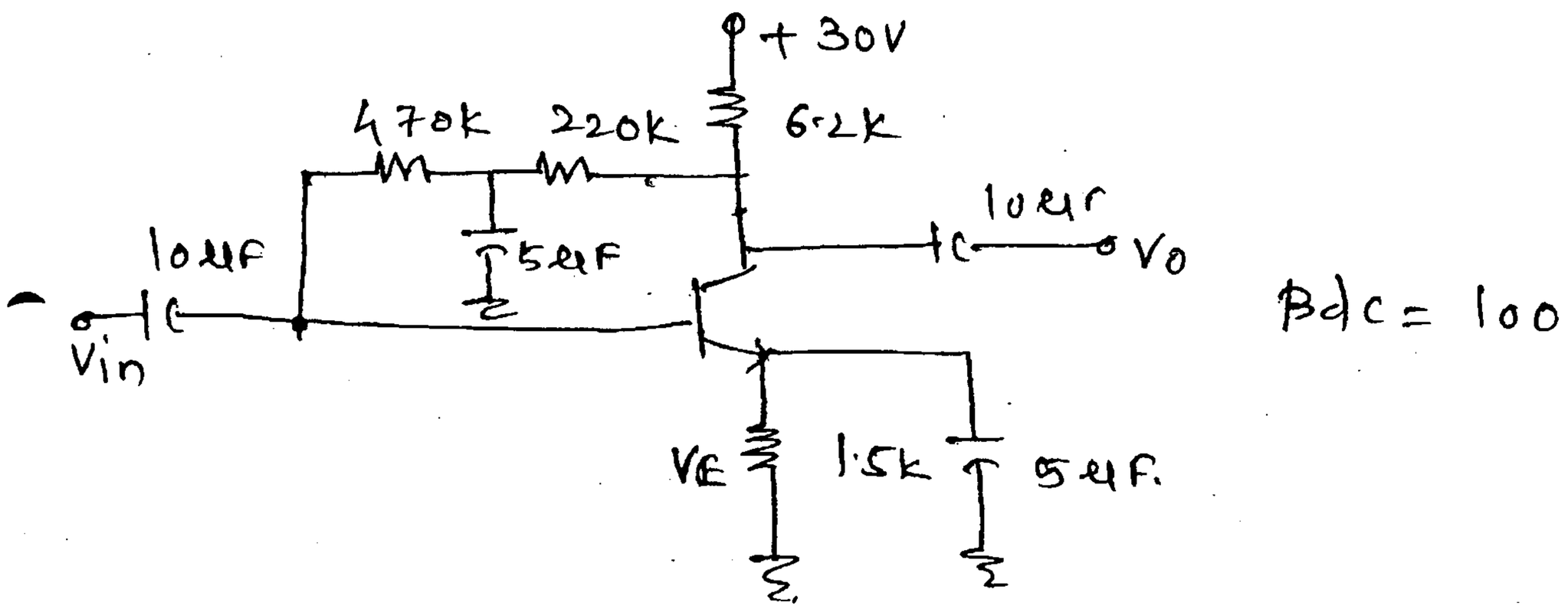
Con. 5411–13. **(OLD COURSE)** **LJ–10283**

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

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

1. (a) Explain the Phenomenon of thermal runaway of BJT. **5**
(b) Derive the condition for zero temperature drift biasing of FET. **5**
(c) Derive the relationship between α and β. **5**
(d) Draw a circuit diagram of voltage multiplier and explain its operation. **5**

2. (a) Draw and explain fullwave rectifier with capacitive filler. Derive expression for ripple factor. **10**
(b) For the circuit shown in **figure.** Determine – **10**
(i) Ic (iii) V_E
(ii) Vc (iv) V_{CE}



3. (a) Design single stage CE amplifier for the following specifications – **15**
$Av \geq 100$, $S = 8$ $Vo = 2{\cdot}5$ V
$F_L = 20$Hz, $Zi = 2{\cdot}7$ kΩ
(b) Determine Av, Zi and Zo for the designed circuit. **5**

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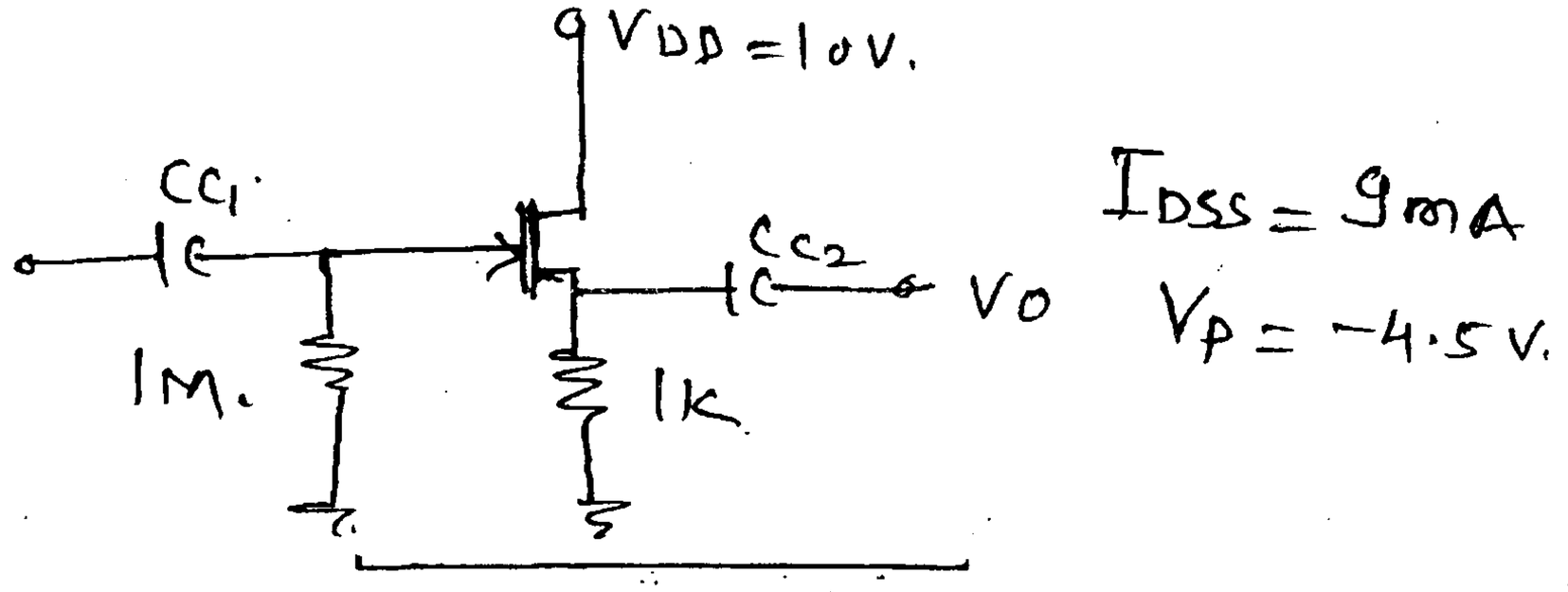
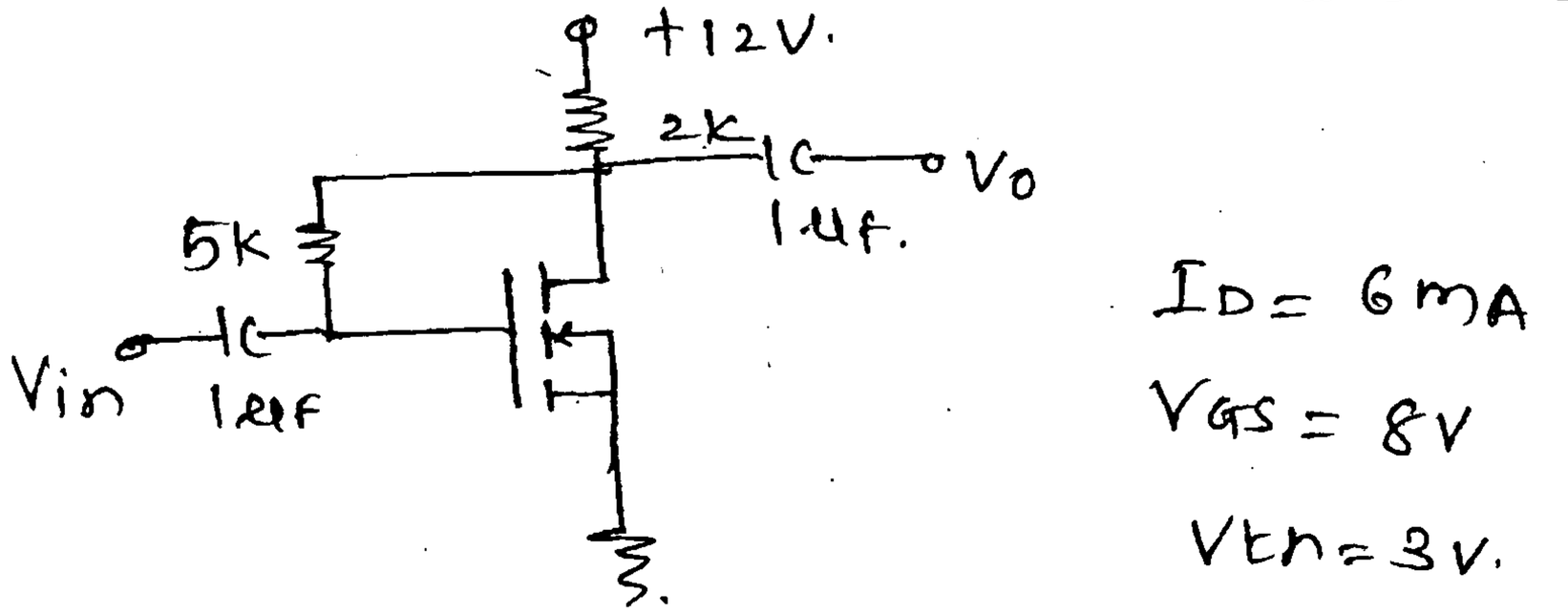
4. (a) For the circuit shown in **figure** find Av, Ri and Ro. **10**



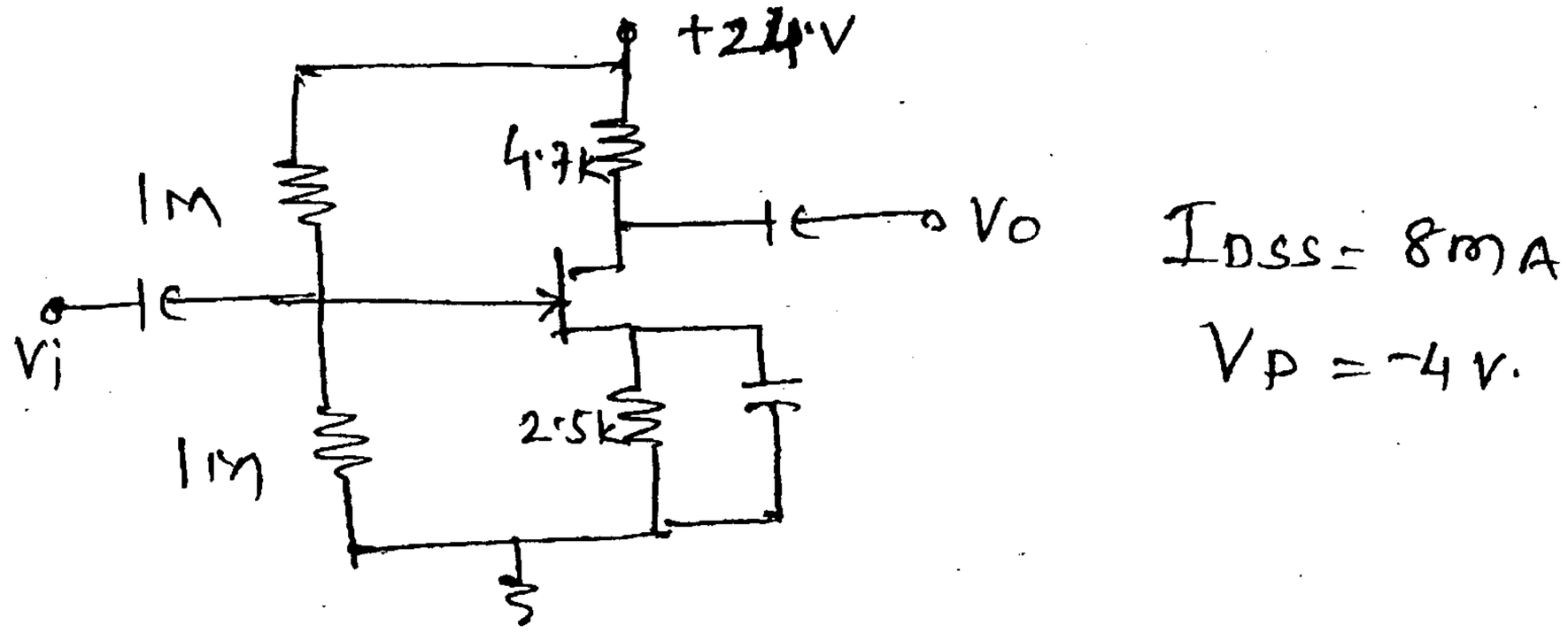
(b) Explain different biasing techniques of D and E MOSFET. **10**

5. (a) For drain Feedback circuit shown in **figure** determine V_{GS}, I_D and V_{DS}. **10**



(b) Explain the construction, working principle and characteristics of DMOSFET. **10**

6. (a) For the circuit shown in **figure** determine Av, Ri and Ro. **10**



(b) Explain thermal stability in BJT. How to active it ? **10**

7. Write a short notes (any **three**) :– **20**

(a) LED

(b) Photodiodes and Photovoltaic cells

(c) Zener as a voltage regulator

(d) Diode clamping circuits.

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