

S.No. : 4

BEE 3402

No. of Printed Pages : 07

Following Paper ID and Roll No. to be filled in your Answer Book.

PAPER ID : 33315

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B. Tech. Examination 2021-22

(Even Semester)

NETWORK ANALYSIS & SYNTHESIS

Time : Three Hours]

[Maximum Marks : 60

- Note :-** (i) This question paper contains three sections.
- (ii) Section A is compulsory section B and C contains internal choices.
- (iii) Be precise in your answers.

SECTION – A

1. Attempt all parts of the following : 8×1=8
- (a) Compare dependent and independent sources.
- (b) Define principle of duality.

[P. T. O.

- (c) Write hybrid parameters in terms of Z-parameters.
- (d) State two properties of the R-L driving point impedance function.
- (e) Define network synthesis.
- (f) Write a definition of convolution.
- (g) Define mutual inductance.
- (h) Determine the range of β such that the polynomial :

$$P(s) = s^4 + s^3 + 4s^2 + \beta s + 3$$

is Hurwitz.

SECTION – B

2. Attempt any two parts of the following : $2 \times 6 = 12$

- (a) For the graph shown in figure (a), consider the tree formed by branches (2, 3, 4), using this tree write incidence matrix, tie set matrix, cut set matrix :

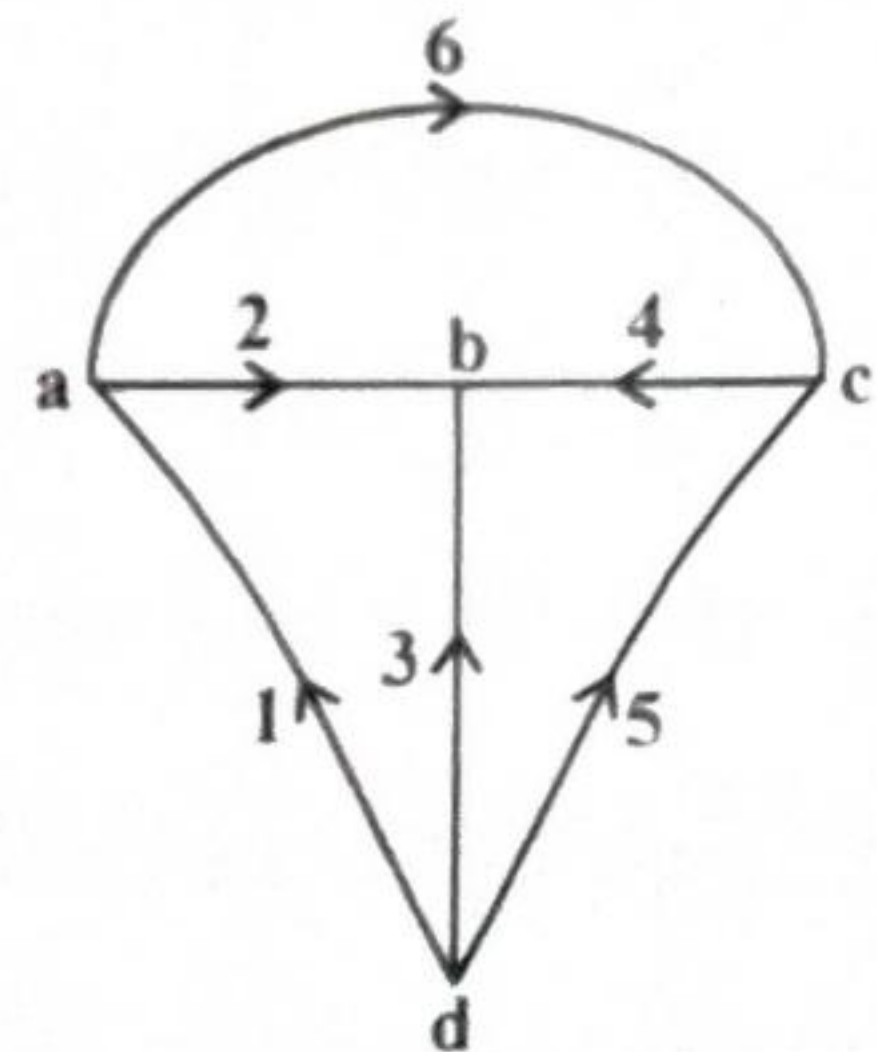


Figure (a)

- (b) Determine the Laplace transform of the periodic, rectified full wave sine wave shown in figure (a) :

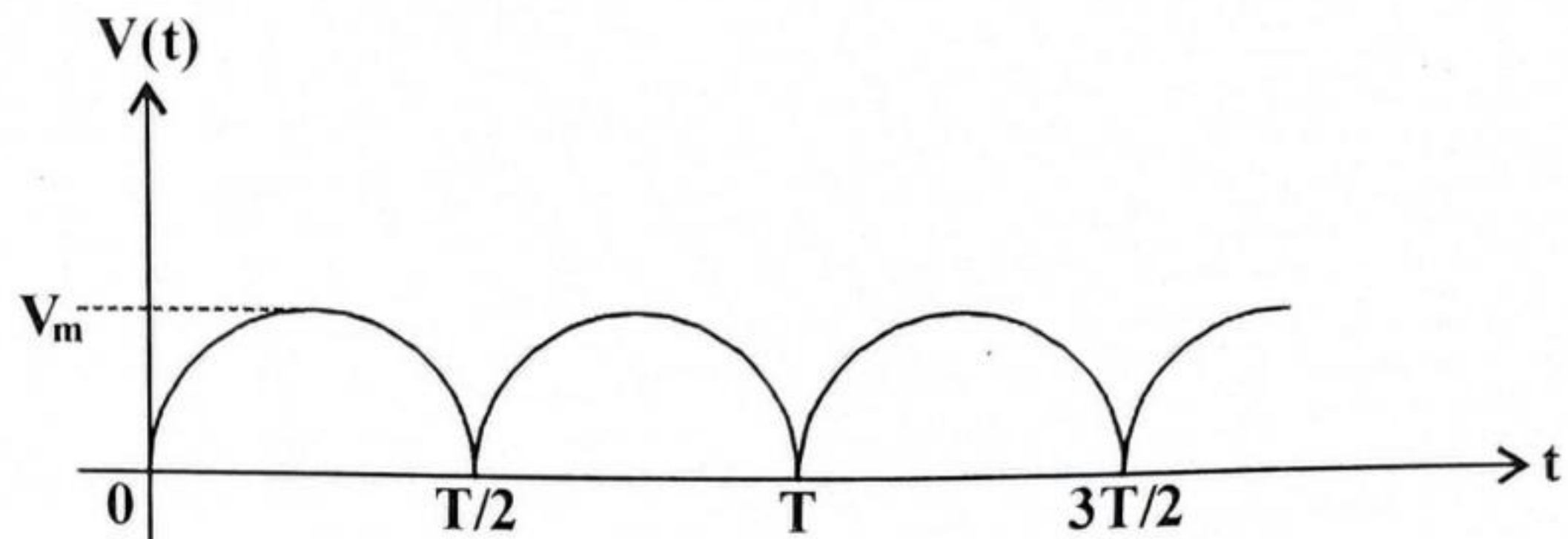
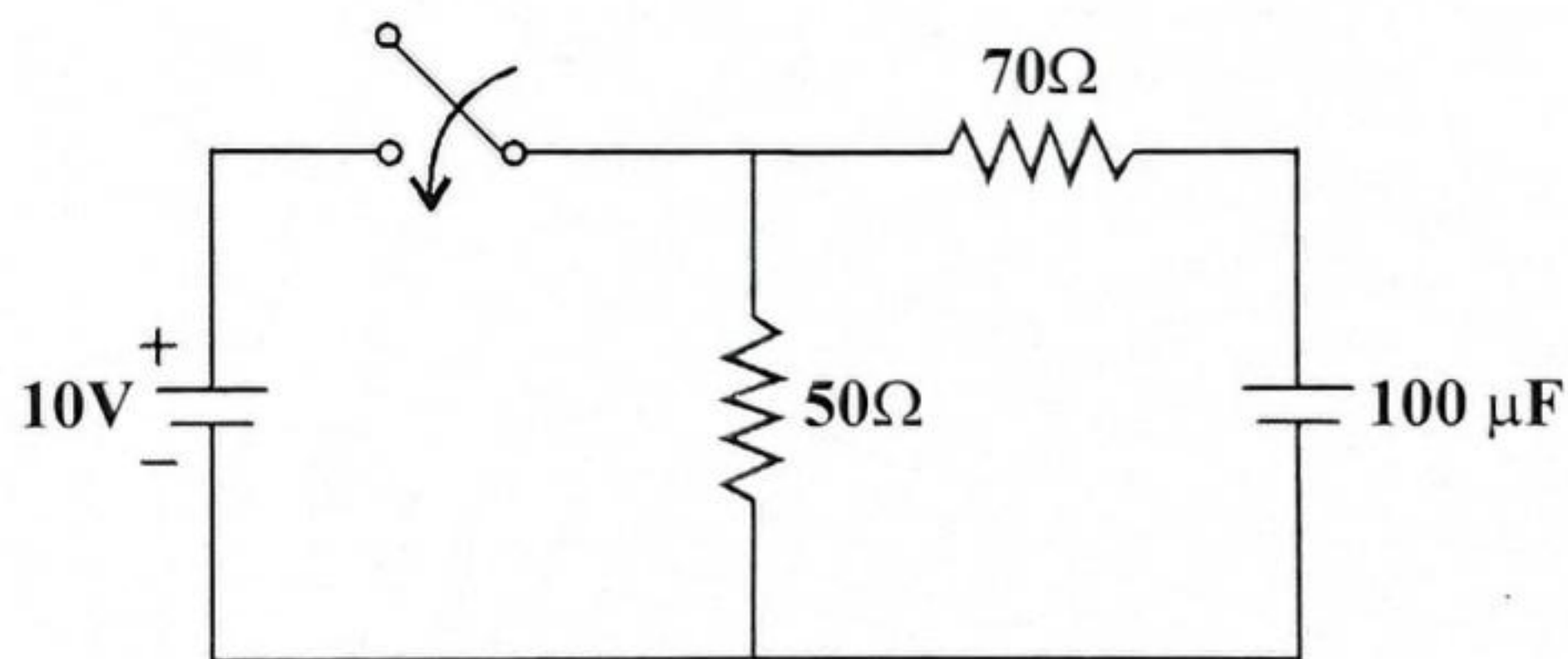


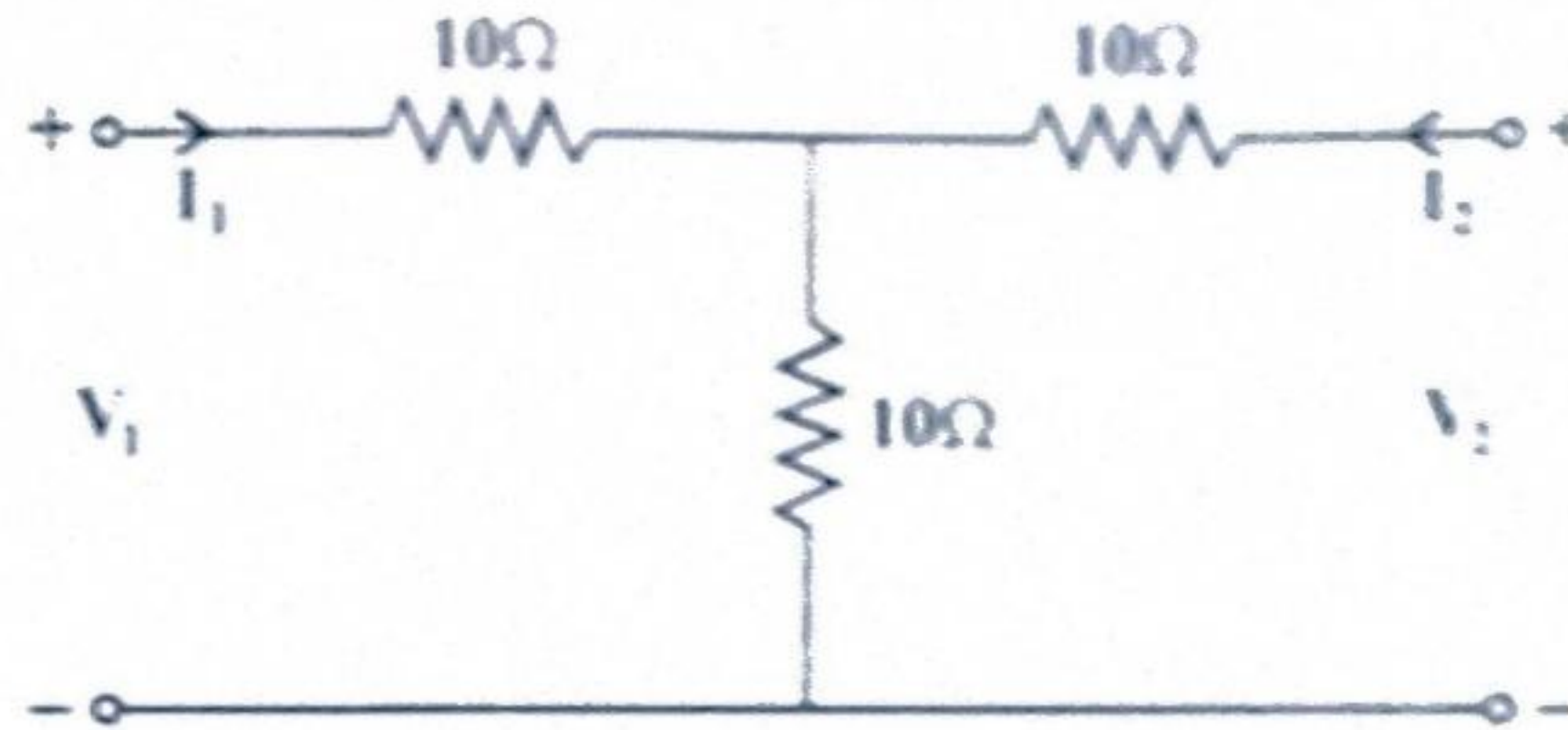
Figure (a)

- (c) In figure (a), the switch S is closed. Find the time when the current from the battery reaches to 500 mA :



- (d) Two identical sections of the network shown in figure (a) are cascaded. Calculate the transmission (ABCD) parameters of the resulting network :

[P. T. O.]



SECTION - C

Note :- Attempt all questions from this section.

10 × 4 = 40

3. Attempt any two parts of the following :

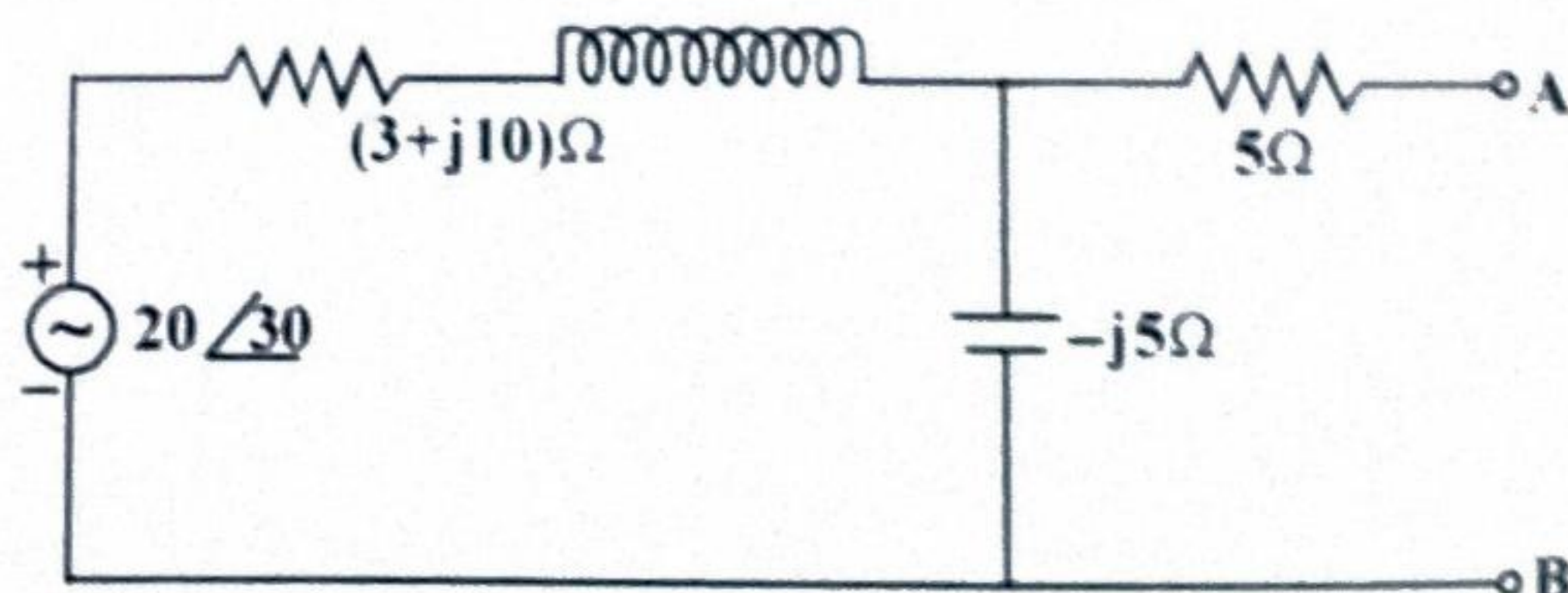
(a) Define with suitable example :

(i) Incidence matrix

(ii) Cut set matrix

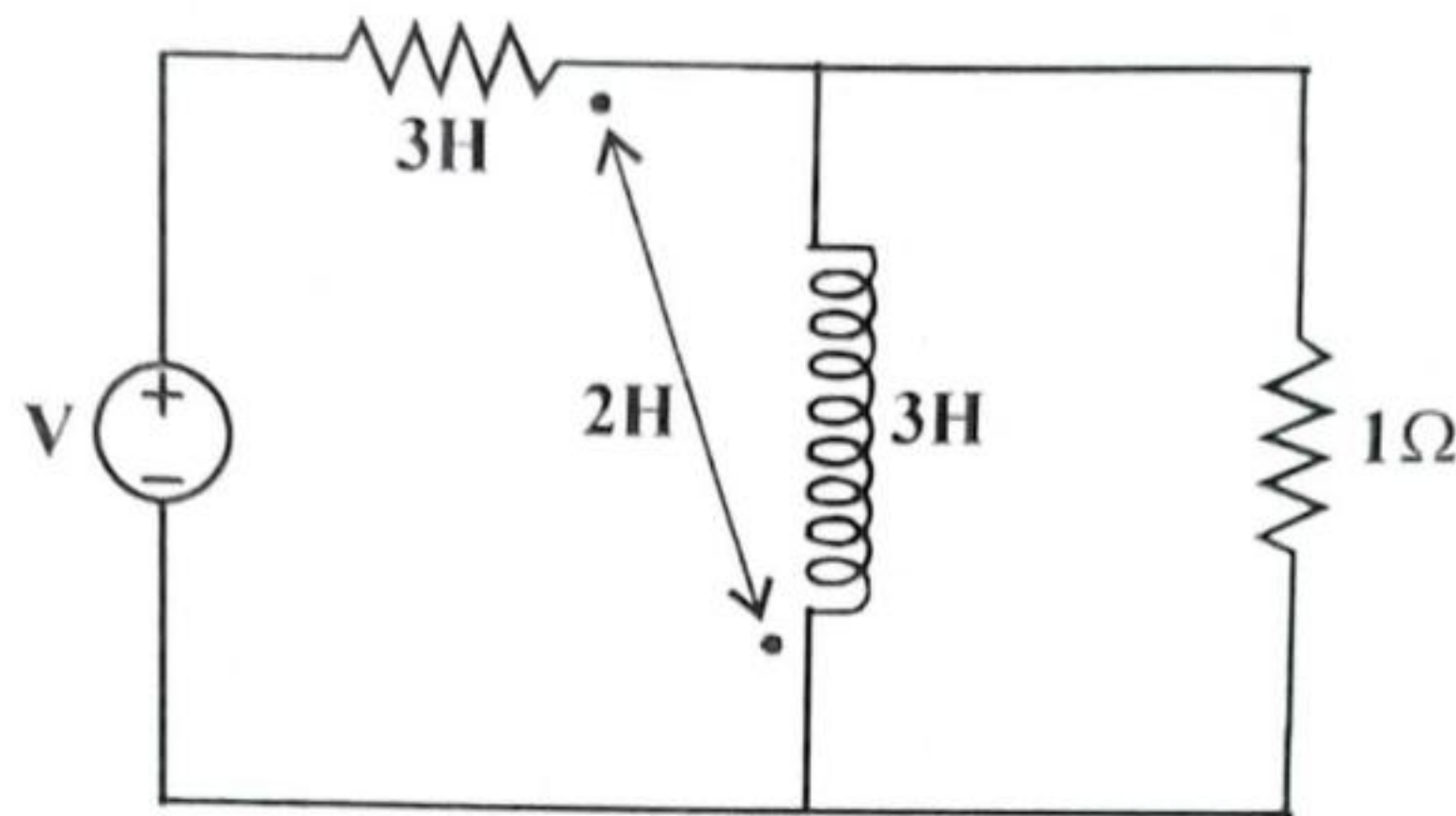
(b) Give the definition for the tree, co tree and link.

(c) Find the Thevenin's equivalent circuit as terminal AB for the circuit shown in figure :



4. Attempt any two parts of the following :

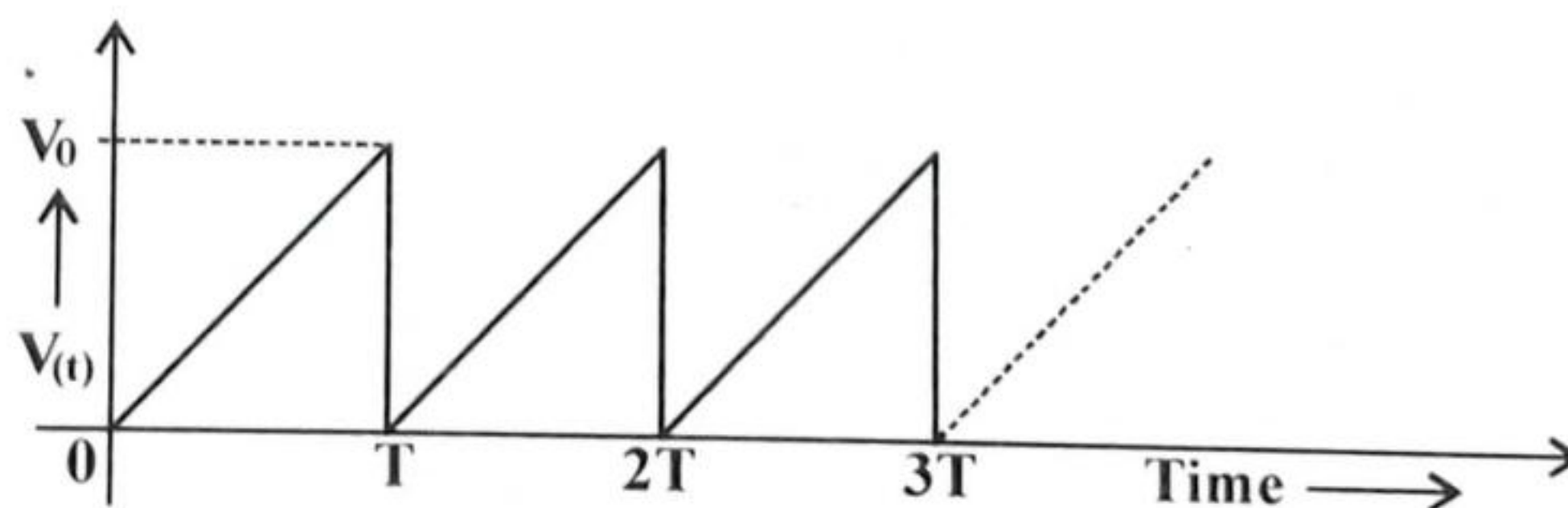
- (a) Draw the oriented graph of the network shown in the following figure. Select loop current variables and write the network-equilibrium equation in matrix form :



- (b) Determine the initial value $f(0^+)$ if :

$$F(s) = \frac{2(s+1)}{s^2 + 2s + 5}$$

- (c) Find the Laplace transform of the waveform shown in figure (a) :



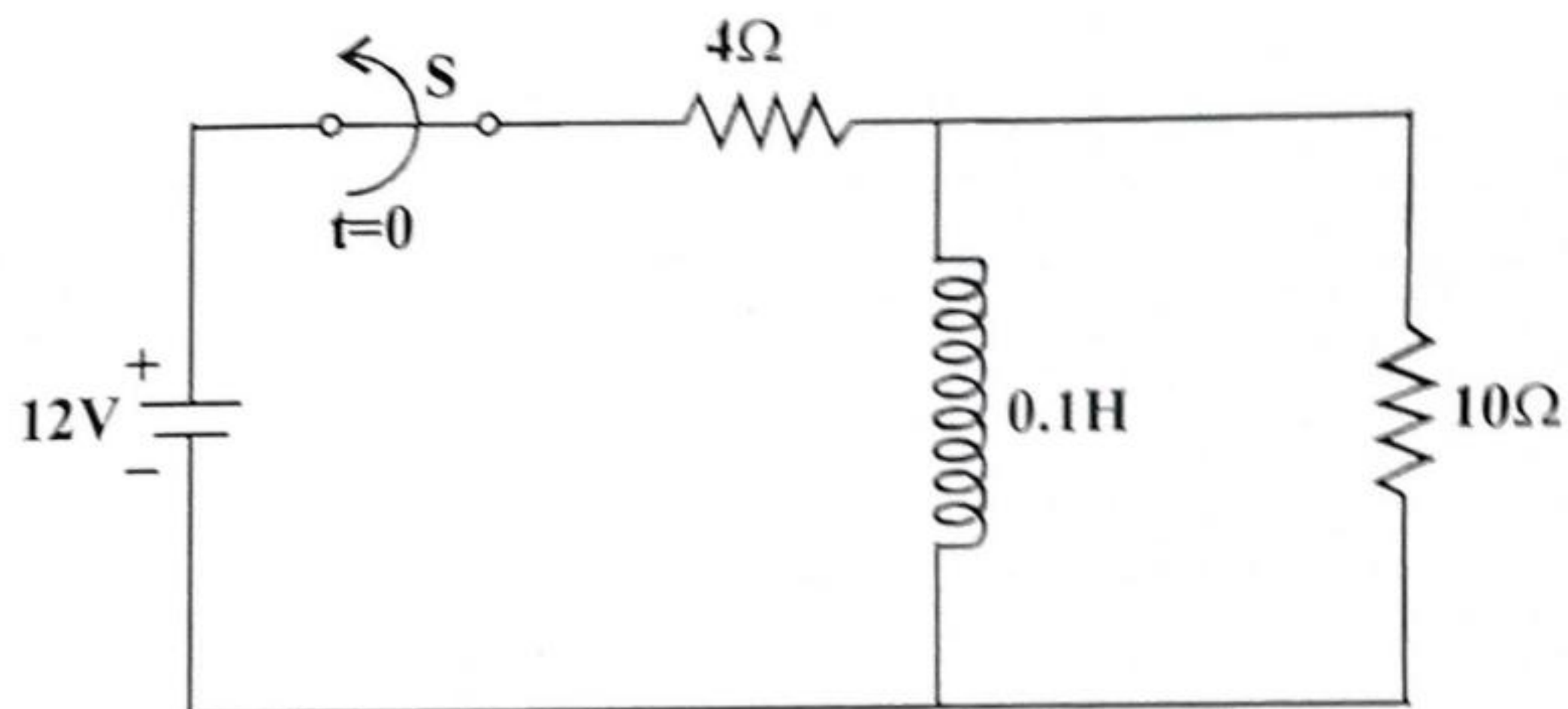
5. Attempt any two parts of the following :

- (a) A resistance R and capacitor $5 \mu\text{F}$ are connected in series across a 100 V d.c. supply. Calculate

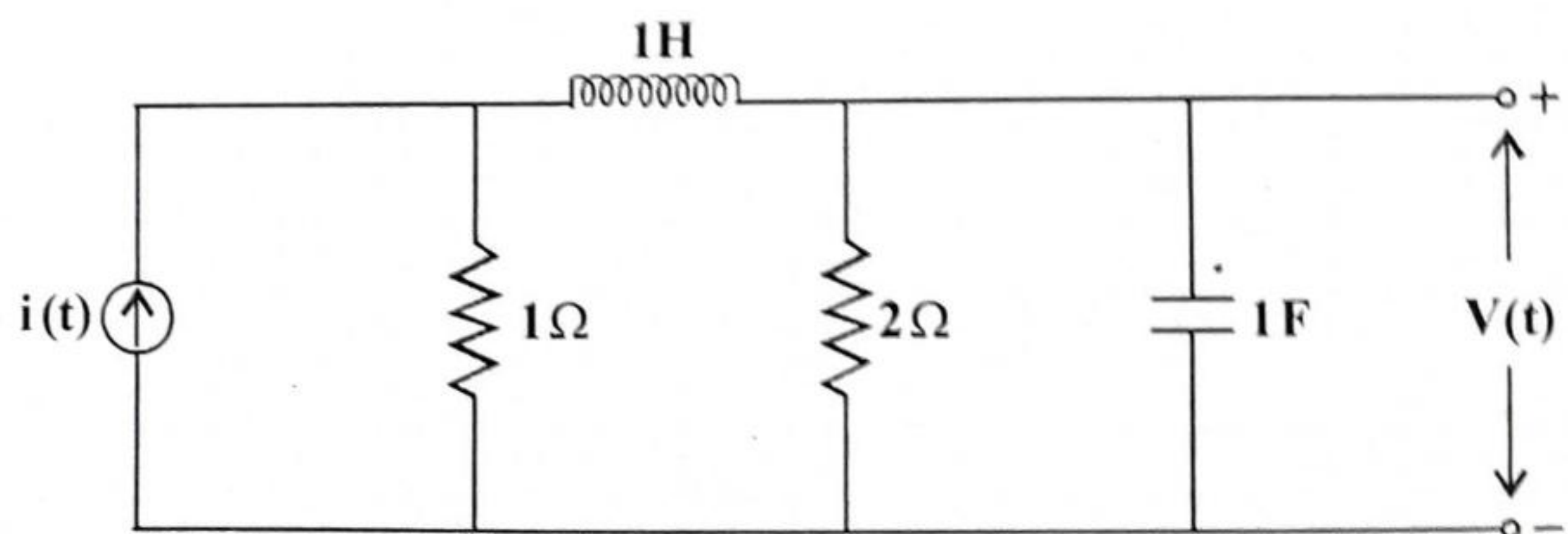
[P. T. O.]

the value of R such that the voltage across the capacitor becomes $50V$ in 5 sec after the circuit is switched on.

- (b) The $12V$ battery in figure is disconnected (opened) at $t = 0$. Find the inductor current and voltage as a function of time :



- (c) Find the differential equation relation $V(t)$ and $i(t)$ in the network shown in figure :



6. Attempt any two parts of the following :

- (a) Obtain the condition of symmetry and reciprocity in terms of h-parameters.

- (b) Prove that in a parallel-parallel interconnected two networks with admittance matrix $[Y_A]$ and $[Y_B]$ respectively, the overall Y-matrix is given as $[Y] = [Y_A] + [Y_B]$.
- (c) Find the first and second faster form of the driving point impedance function :

$$Z(s) = \frac{2(s+2)(s+5)}{(s+1)(s+4)}$$
