

S.E. E~~X~~TC SEM III NEP June 2026.

Time: 2 hours

Marks: 60

(15)

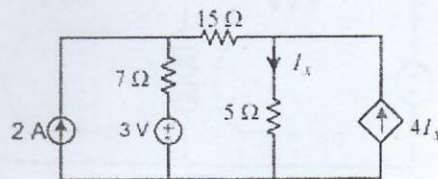
11/06/26.

## 1. Attempt any five questions.

- Compare independent and dependent energy sources with appropriate example.
- What do you mean by initial conditions with reference to time domain analysis of R-L-C circuit?
- What is two port network? Compare it with one port network.
- With suitable examples, write comparisons of open loop and closed loop control system.
- Define delay time, rise time and settling time of second order control system.
- What is breakaway point in root locus/ how will you decide the valid breakaway point.
- What is GM and PM in Bode plot/ how to decide stability of system with the help of GM and PM.

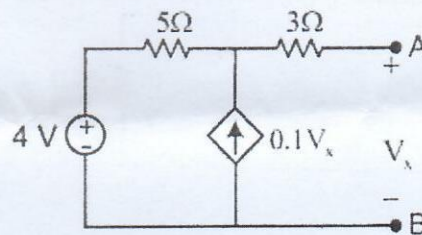
2 a) Use superposition theorem to find  $I_x$  in the circuit shown in following Figure

(08)

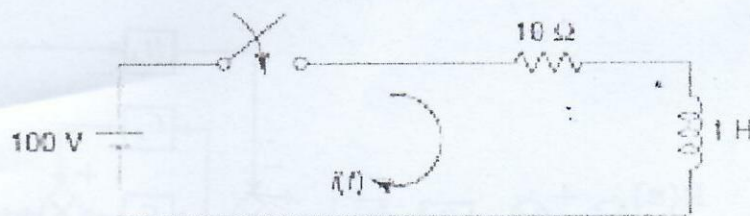


## 2 b) Determine the Thevenin's equivalent of the circuit across terminals A-B shown in following network

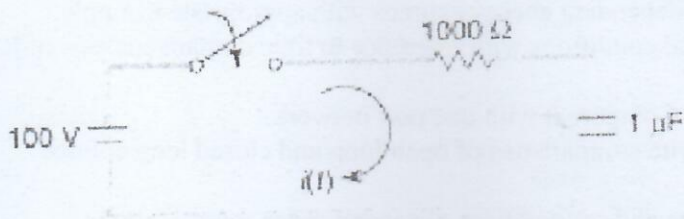
(07)

3 a) In the following network, the switch is closed at  $t=0$ . With zero initial conditions, find  $i$ ,  $di/dt$  and  $d^2i/dt^2$  at  $t=0^+$ 

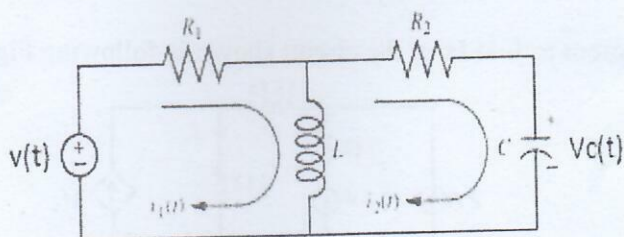
(08)



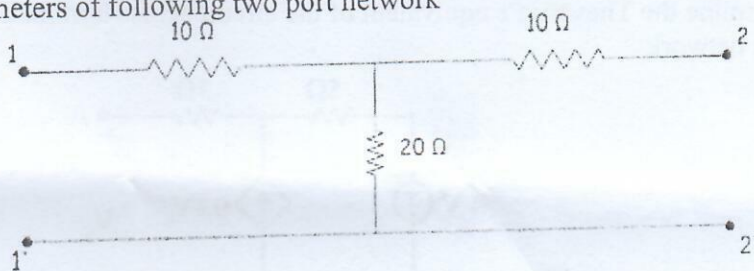
- 3 b) In the following figure, the switch is closed at  $t=0$ . With the uncharged capacitor, find  $i$ ,  $di/dt$  and  $di^2/dt^2$  at  $t=0^+$  (07)



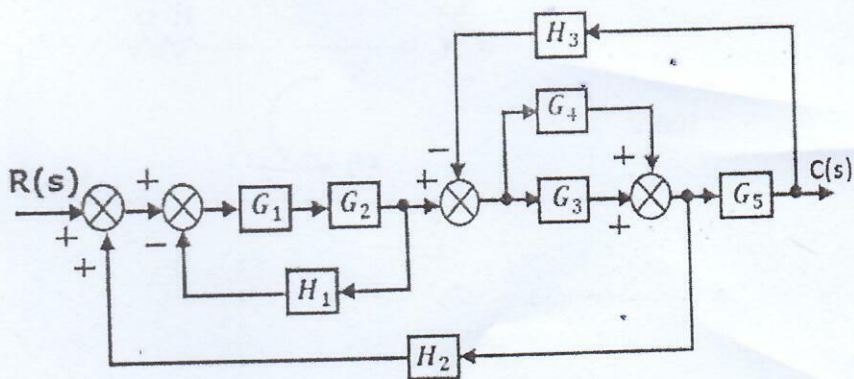
- 4 a) Determine transfer function for the given electrical network where  $v(t)$  is input voltage and  $V_c(t)$  is output voltage in time domain (08)



- 4 b) Determine Z-parameters of following two port network (07)



- 5 a) Determine the transfer function of a control system shown by following block diagram (08)



- 5 b) Determine the stability of a system shown by  $S^5 + 2S^4 + 4S^3 + 6S^2 + 2S + 5$  using Routh Hurwitz criterion. Also, comment on location of its roots on S-plane. (07)

6 a) The open loop transfer function of a unity negative feedback system is given by

$$\frac{K}{s(s+1)(s+2)}$$

Draw the root locus as the value of k varies from zero to Infinity.

(08)

6 b) Draw Bode plot for the unity feedback system shown by transfer function

$$G(s) = \frac{100}{s(s+2)(s+25)}$$

(07)

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