D 90023 (Pages : 4) Name.....

Reg. No.....

THIRD SEMESTER B.TECH. (ENGINEERING) DEGREE [14 SCHEME] EXAMINATION, NOVEMBER 2015

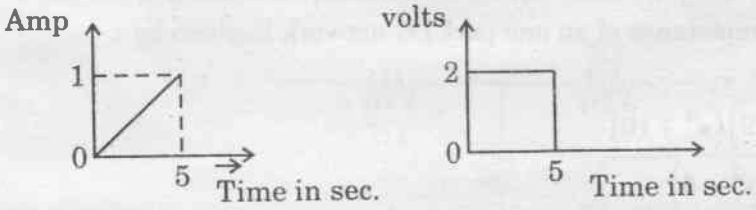
EC 14 303—NETWORK ANALYSIS AND SYNTHESIS

Time : Three Hours Maximum : 100 Marks

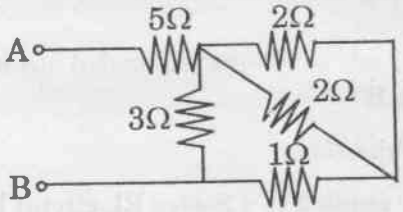
Answer any **eight** *questions.*

Part A

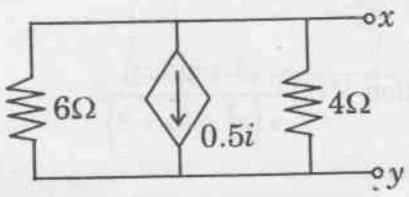
I. (a) The current and voltage profile of an element Vs time has been shown below. Determine the element and find its value :



(b) Find the equivalent resistance of the circuit shown across AB.



(c) Find Norton's equivalent circuit to the left of the terminal :

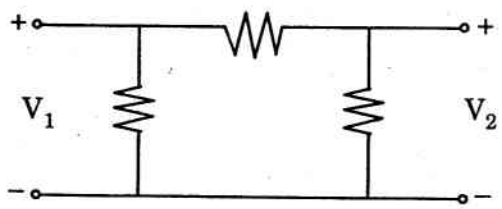


(d) A network function is given by

$$p(s) = \frac{2s}{(s+2)\left(s^2+2s+s\right)}$$. Obtain the pole zero diagram.

Turn over

(e) Find the Y parameters of the network shown :



(f) Explain the characteristics of different types of filter.

(g) Design a T type attenuator to give an attenuation of 60 dB and to work in a line of 500 Ω impedance.

(h) What is positive real function ? State its properties.

(i) The driving point impedance of an one port LC network is given by :

$$Z(s) = \frac{2\left(s^2+9\right)\left(s^2+16\right)}{s\left(s^2+4\right)}.$$

Obtain the Foster form of LC Network realization.

(j) How realization of LC network is done using Cauer first form.

(8 × 5 = 40 marks)

Part B

Answer **all** *questions.*

II. (a) (i) A direct voltage of 200 V is suddenly applied to a Series RL circuit having R = 20 Ω and inductance of 0.2 H. Determine the voltage drop across the inductor at the instant of switching on and at 0.02 sec. later.

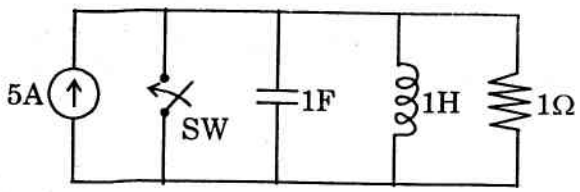
(10 marks)

(ii) Obtain steady state solution of the function $F(s)\frac{s^2+3s+1}{s\left(s^2+3s+2\right)}$.

(5 marks)

Or

(b) (i) For the figure shown below, find the voltage, across the switch when switch is suddenly opened at $t = 0$. Assume no charge is present on the capacitor and no current is present in the inductor before switching :

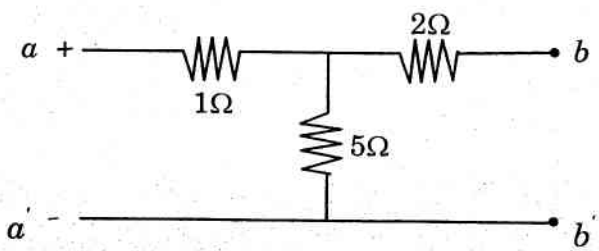


(10 marks)

(ii) State and prove superposition theorem. (5 marks)

III. (a) (i) Explain the limitations on pole and zero location in transfer function. (8 marks)

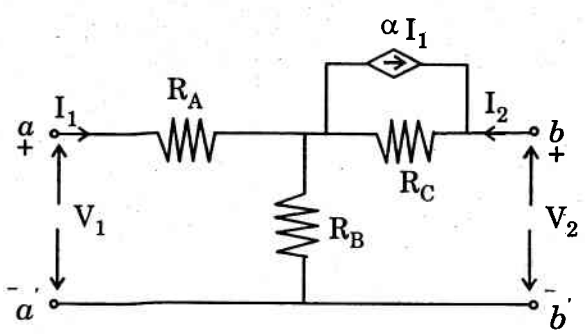
(ii) Find the transmission parameters for the circuit shown :



(7 marks)

Or

(b) (i) Find the hybrid parameter of the following circuit :—



(8 marks)

(ii) Obtain the time domain response for the network function $I(s) = \dfrac{5s}{(s+1)(s^2+4s+8)}$.

(7 marks)

IV. (a) (i) Analyse the design of a third order Low Pass Butterworth filter to meet the specifications $w_p = 700$ Hz, $w_s = 5000$ Hz, $A_{max} = 2$dB, $A_{min} = 20$ dB.

(8 marks)

(ii) Analyse and design symmetrical bridged–T attenuator with an attenuration of 20 dB and terminated into a load of 500 Ω.

(7 marks)

Or

(b) (i) Realize Chebyshev's polynomial using approximation. (7 marks)

(ii) Design a band elimination filter with cut-off frequencies $f_1 = 2$kHz and $f_2 = 6$ kHz. How transformation from low-pass to High-pass carried out ? Give an example.

(8 marks)

V. (a) (i) Test whether the polynomial

$$p(s) = s^8 + 3s^7 + 10s^6 + 24s^5 + 57s^3 + 50s^2 + 36s + 24 \text{ is Hurwitz.}$$

(5 marks)

(ii) Synthesize the RL driving point impedance

$$z(s) = \frac{2(s+1)(s+3)}{(s+2)(s+6)}$$

to get Foster first form and Cauer second form of realization.

(10 marks)

Or

(b) (i) Synthesize the RC driving point impedance $z(s) = \frac{(s+1)(s+3)}{s(s+2)}$ in term of Cauer first and second form of realization.

(10 marks)

(ii) Check the positive realness of the function $\frac{s^2 + 6s + 5}{s^2 + 9s + 14}$. (5 marks)

[4 × 15 = 60 marks]