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B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2007.

Third Semester

Electronics and Communication Engineering

EC 231 - NETWORK ANALYSIS AND SYNTHESIS

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is a network element? Distinguish between active and passive elements.

2. A series RL circuit, with R = 10 Ω and L = 1 H, has a 100 V source applied at t = 0. Find the current for t > 0.

3. Define state of a dynamical system.

4. Mention the limitations of PSPICE.

5. A polynomial P (s) expressed in factored form is given by P (s) = (s – 2) (s + 1) (s + 3). Check whether the polynomial is Hurwitz or not.

6. For the ladder network shown, represent the driving point impedance in the form of continued fraction.
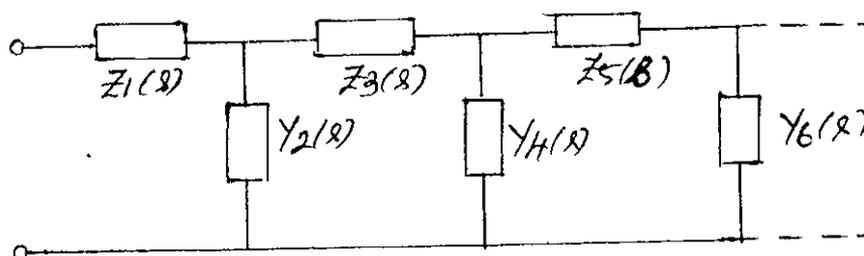
7. Give the T and π configuration of low pass filter.

8. The cut-off frequency of an LPF with RC configuration is 500 Hz. Assuming R = 500 Ω, find the value of C.

9. Draw the schematic diagram of an active high pass filter.

10. Mention the advantages of active filters.

11. (a) (i) Define z-parameters of a two-port network and give the z-parameter model. (8)

(ii) The following readings are obtained experimentally for an unknown two-port network. Compute the z-parameters. (8)

Output open	V_1	V_2	I_1	I_2
	300 V	60 V	10 A	0
Input open	30 V	40 V	0	3 A

Or

(b) (i) In a series R-L circuit, the current and voltage are given as $i = 1 \cos(314 t - 20°)$, $v = 10 \cos(314 t + 10°)$. Find the values of R and L. (8)

(ii) Obtain transmission parameters in terms of admittance parameters. (8)

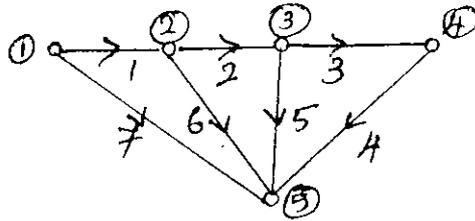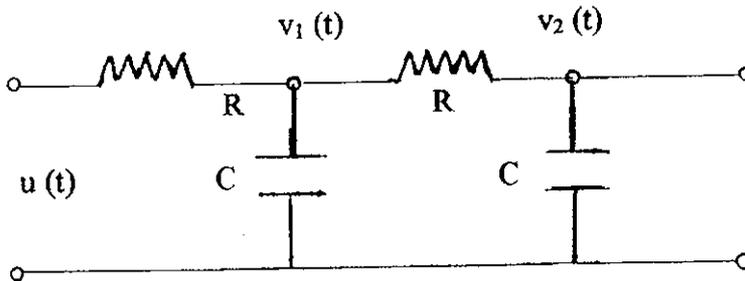12. (a) (i) Obtain the incidence matrix of the graph shown in Fig. 1. (6)

Fig.1.

(ii) For the system shown in Fig.2, choose $v_1(t)$ and $v_2(t)$ as state variables and write down the state equations satisfied by them. Bring these equations in vector matrix form. (10)

$R = 1\ M\Omega,\ C = 1\ \mu F$

Fig.2

Or

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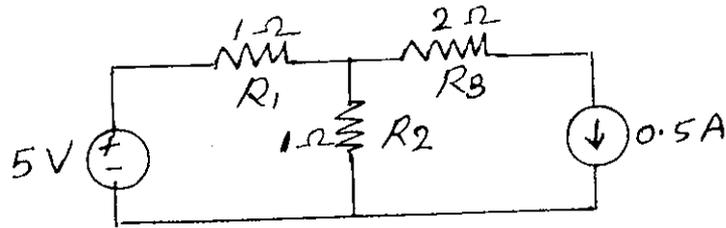(b) (i) For the circuit of Fig.3, write the PSPICE program. (8)

Fig.3

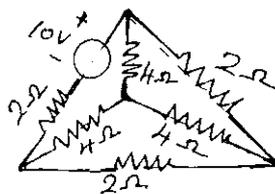(ii) Write the fundamental loop matrix of the network shown in Fig. 4. (8)

Fig.4

13. (a) (i) Test whether the polynomial $s^5 + s^3 + s$ is Hurwitz or not. (6)

(ii) The driving point impedance of a one port LC network is given by $Z(s) = 10(s^2 + 4)(s^2 + 25)/s(s^2 + 9)$ Obtain the second Foster form. (10)

Or

(b) (i) Check whether $Z(s) = 4s + 1/s + 2$ is a positive real function. (6)

(ii) Synthesize the network having driving point impedance given by $Z(s) = (2s^5 + 10s^3 + 10s)(s^4 + 4s^2 + 3)$ in the first Cauer form. (10)

14. (a) Design a constant K-low pass filter having cut-off frequency 2.5 kHz and design resistance $R_0 = 700\ \Omega$. Also find the frequency at which this filter produces attenuation of 19.1 dB. Find its characteristic impedances and phase constant at pass band and stop or attenuation band. (16)

Or

(b) Design a prototype band pass filter to match with a load of 600 Ω and to allow frequencies between 3 kHz and 6 kHz. (16)

15. (a) (i) Describe the realization of active second order Butterworth low pass filter. (8)

    (ii) Design an active second order Butterworth low pass filter with cut-off frequency of 1 kHz. (8)

    Or

    (b) Draw and explain the schematic of a first and second order high pass filter. (16)

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