

## Third Semester B.E. Degree Examination, Dec.09/Jan.10 Network Analysis

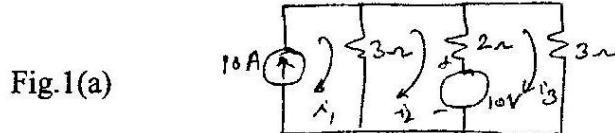
Time: 3 hrs.

Max. Marks:100

**Note: Answer any FIVE full questions, selecting at least TWO questions from each part.**

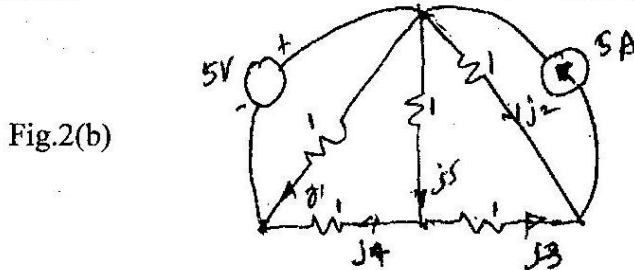
### PART - A

- 1 a. Write the mesh equations for the circuit shown in Fig.1 and solve for currents  $i_1$ ,  $i_2$  and  $i_3$ . (10 Marks)

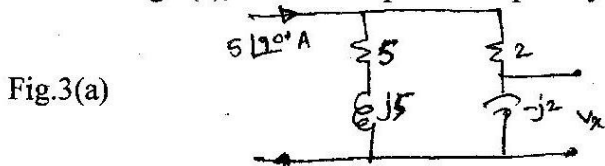


- b. The node voltage equations of a network are  $\left(\frac{1}{5} + \frac{1}{2}j + \frac{1}{4}\right) v_1 - \frac{1}{4} v_2 = \frac{50 \angle 0^\circ}{5}$  and  $-\frac{1}{4} v_1 + \left(\frac{1}{4} - \frac{1}{j2} + \frac{1}{2}\right) v_2 = \frac{50 \angle 90^\circ}{2}$ . Derive the network. (10 Marks)

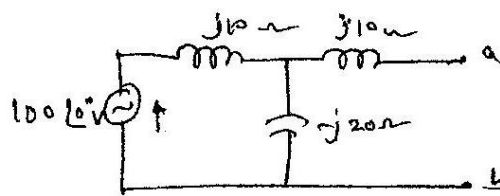
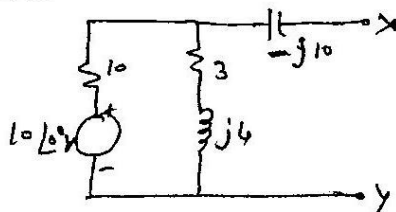
- 2 a. Define the following terms with respect to the network topology. Give examples.  
 i) Tree ; ii) Graph ; iii) Sub graph ; iv) Tieset ; v) Cutset. (08 Marks)  
 b. For the network shown in Fig.2(b), write the graph and obtain the tieset schedule considering  $j_1, j_2, j_5$  as tree branches. Also calculate all branch currents. (12 Marks)



- 3 a. In the circuit shown in Fig.3(a), find  $v_x$  and prove reciprocity theorem. (10 Marks)



- b. State and explain super position theorem with a suitable example. (10 Marks)
- 4 a. Obtain the Thevenin's equivalent network for the circuit in Fig.4(a) between the terminals X and Y. (10 Marks)



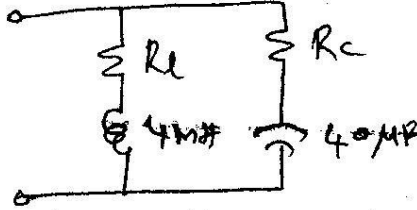
- b. What should be the value of pure resistive load to be connected across the terminals a and b in the network shown in Fig. 4(b), so that maximum power is transferred to the load? Calculate the maximum power. (10 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
 2. Any revealing of identification, appeal to evaluator and/or equations written eg. 42+8 = 50, will be treated as malpractice.

## PART - B

- 5 a. Show that for a series RLC resonant circuit the selectivity  $\phi = \frac{f_0}{f_2 - f_1}$ , where  $f_0$ : resonant frequency  $f_1$  and  $f_2$  are half power frequency. (08 Marks)
- b. Determine  $R_L$  and  $R_C$  for which the circuit shown in Fig.6 resonates at all frequencies. (06 Marks)

Fig.5(b)



- c. It is required that a series RLC circuit should resonate at 1 MHz. Determine values of  $R$ ,  $L$  and  $C$  if bandwidth of the circuit is 5 kHz and its impedance is  $50 \Omega$  at resonance. (06 Marks)
- 6 a. Explain the importance of study of initial conditions in electric circuit analysis. (06 Marks)
- b. Explain the behaviour of  $R$ ,  $L$  and  $C$  elements for transients. Mention their representation at the instant of switching. (06 Marks)
- c. In the circuit shown in Fig.6(c), the switch is moved from 'a' to 'b' at  $t = 0$ . Find the values of  $i$ ,  $\frac{di}{dt}$ ,  $\frac{d^2i}{dt^2}$  at  $t = 0^+$ , if  $R = 1 \Omega$ ,  $L = 1 \text{ H}$ ,  $C = 0.1 \mu\text{F}$  and  $V = 100 \text{ V}$ . Assume steady state is achieved when  $k$  is at 'a'. (08 Marks)

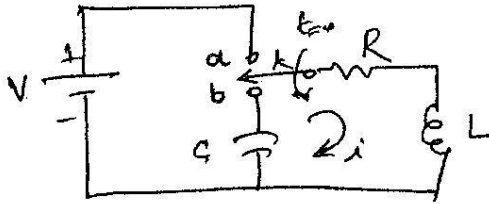


Fig.6(c).

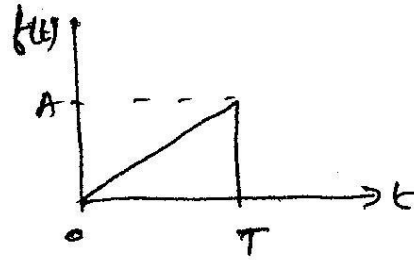


Fig.7(a).

- 7 a. Obtain the Laplace transform of saw tooth waveform shown in Fig.7(a). (06 Marks)
- b. Find the Laplace transform of i)  $\delta(t)$ ; ii)  $t$ ; iii)  $e^{-at}$ . (06 Marks)
- c. Find  $f(0)$  and  $f(\infty)$  using initial value and final value theorem for the function given below.

$$F(s) = \frac{s^3 + 7s^2 + 5}{s(s^3 + 3s^2 + 4s + 2)}$$

(08 Marks)

- 8 a. Find y parameters for the network shown in Fig.8(a). (08 Marks)

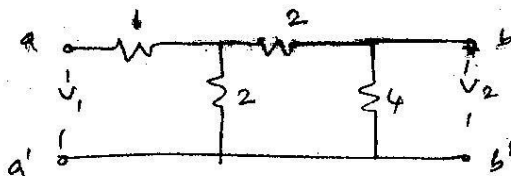


Fig.8(a).

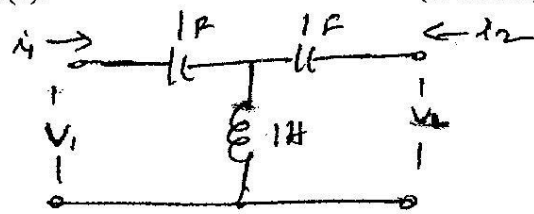


Fig.8(b)

- b. Determine the 'h' parameters for the network shown in Fig.8(b). (08 Marks)
- c. Mention the application of  
i) Transmission parameters ; ii) 'h' parameters ; iii) 'z' parameters. (04 Marks)

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