R13

Code No: 114AC

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year II Semester Examinations, May - 2015
NETWORK THEORY
(Electrical and Electronics Engineering)

Time: 3 Hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit.
Each question carries 10 marks and may have a, b, c as sub questions.

PART- A **(25 Marks)**

1.a) Two watt meters connected to a 3-phase motor indicate the total power input to be 12 kW. The power factor is 0.6. Determine the readings of each watt meter. [2M]

b) If $\mathbf{V}_{ab} = 240\ \mathrm{V} \angle 15^0$ for the circuit shown figure 1 below, what is the value of I_{ab}. [3M]

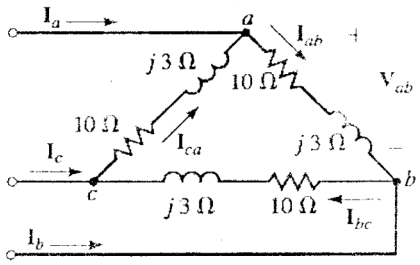

Figure: 1

c) In the circuit shown figure 2, the capacitor voltage just before $t = 0$ is [2M]

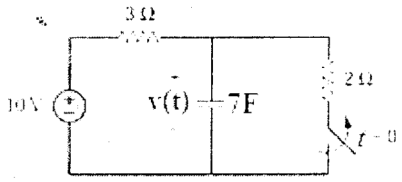

Figure: 2

d) The switch in the figure 3 has been open for a long time. It is open at $t = 0$, the value of $v(\infty)$. [3M]

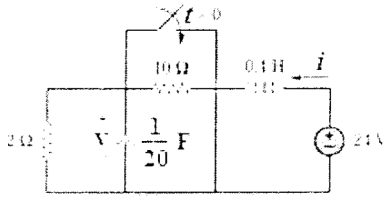

Figure: 3

e) A function is given by $Z(s) = \dfrac{2s}{s^2+16}$. Draw its pole –zero plot. [2M]

f) List the conditions for location of poles and zeros of driving point functions. [3M]

g) In a two port network, obtain the condition for reciprocity in terms of H parameters. [2M]

h) A two-port network is described by $V_1 = I_1 + 2V_2$ and $I_2 = -2I_1 + 0.4V_2$. Find the Impedance matrix? [3M]

i) A voltage source supplies a signal of constant amplitude, from 0 to 40 kHz, to an RC low-pass filter. The load resistor experiences the maximum voltage at which frequency? [2M]

j) State and explain time duality property of Fourier transform. [3M]

PART-B **(50 Marks)**

2.a) A balanced delta-connected load has a phase current $I_{AC} = 10\angle -30^0$ A:

i) Determine the three line currents assuming that the circuit operates in the positive phase sequence.

ii) Calculate the load impedance if the line voltage is $V_{AB} = 110\angle 0^0$ V.

b) A balanced star-connected load absorbs a total power of 5 KW at a leading power factor of 0.6 when connected to a line voltage of 240 V. Find the impedance of each phase and the total complex power of the load. [5+5]

OR

3.a) The unbalanced Δ-load as shown in Figure 4 below is supplied by balanced voltages of 200V in the positive sequence. Find the line currents. Take $\mathbf{V}_{ab}$ as reference.

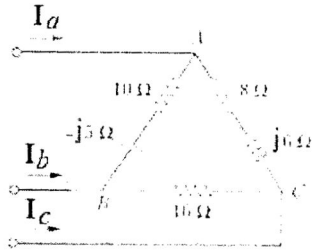

Figure: 4

b) Prove that two watt-meters are sufficient to measure power in three phase system. [6+4]

4.a) The switch in the figure 5 has been in position *a* for a long time, At t = 4 s the switch is moved to position *b* and left there. Determine $v(t)$ at t = 10 s.

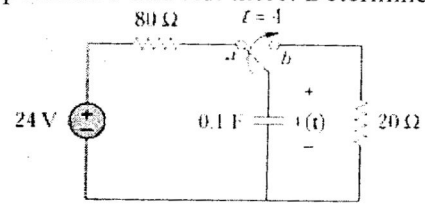

Figure: 5

b) The switch in Figure 6 was open for a long time but closed at t = 0. Determine: (i) i(0+), v(0+), (ii) i(∞), v(∞). [4+6]

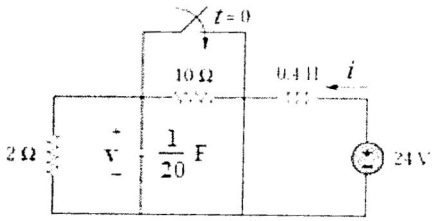

Figure: 6

OR

5.a) The switch in Figure 7 has been in position A for a long time. At t = 0,the switch moves to B. Determine v(t) for t > 0 and calculate its value at t = 1 s and 4 s.

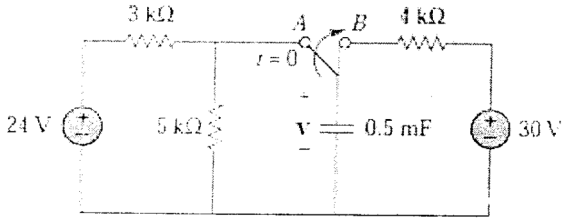

Figure: 7

b) At t = 0, switch 1 in Figure 8 is closed, and switch 2 is closed 4 s later. Find i(t) for t > 0. Calculate i for t = 2 s and t = 5 s. [5+5]

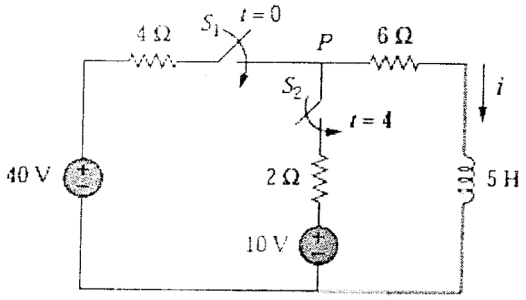

Figure: 8

6. What is the driving point and transfer impedance of the network shown figure 9 below? [10]

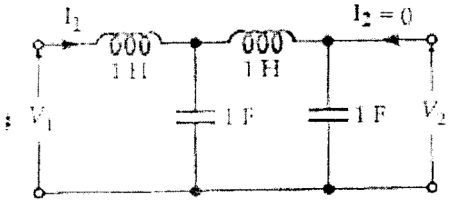

Figure: 9

OR

7.a) Find the expression for voltage transformation ratio for the network shown figure 10 below.

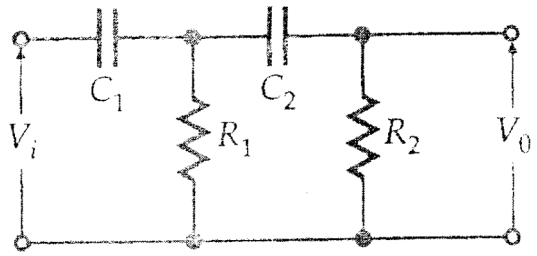

Figure: 10

b) Find the pole- zero plots of the driving point and transfer impedances of the network shown figure 11 below. [5+5]

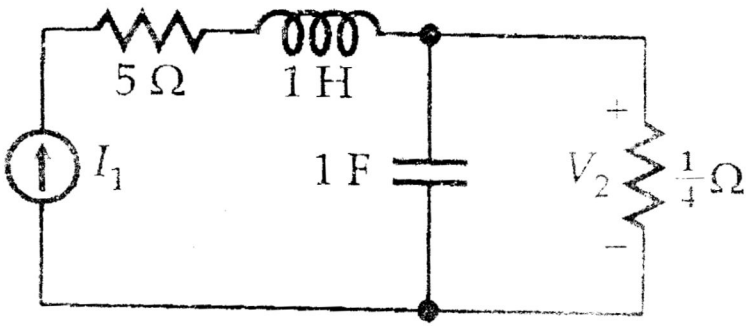

Figure: 11

8.a) Determine the *h* parameters for the circuit shown figure 12 below.

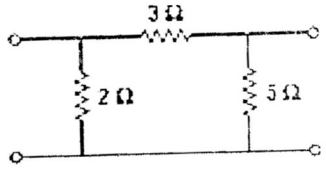

Figure: 12

b) Determine [y] and [T] of a two-port network shown in figure 13 whose *z parameters* are $Z = \begin{bmatrix} 6 & 4 \\ 4 & 6 \end{bmatrix}$. [5+5]

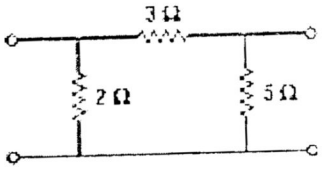

Figure: 13

OR

9.a) Find the *y* parameters of the two-port network shown figure 14 below.

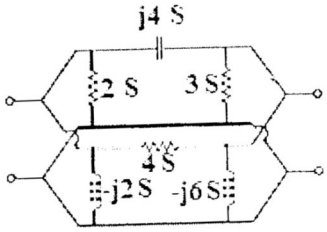

Figure: 14

b) Find the impedance-parameter equivalent of the circuit shown figure 15 below. [6+4]

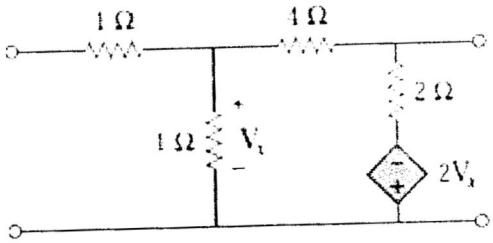

Figure: 15

10.a) A filter section is to have a characteristic impedance at zero frequency of 600 Ω and a cut-off frequency at 5 MHz. Design (a) a low-pass T section filter, and (b) a low-pass π section filter to meet these requirements.

b) Calculate the Fourier series for the function shown in figure 16 below. [5+5]

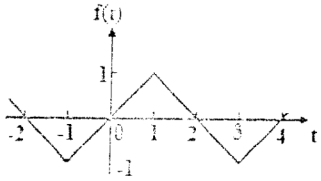

Figure: 16

OR

11.a) A filter is required to pass all frequencies above 25 kHz and to have a nominal impedance of 600 Ω. Design (i) a high-pass T section filter and (ii) a high-pass π section filter to meet these requirements.

b) Using the Fourier transform method, find $i_o(t)$,when i_s (t) = 10 sin 2t A (Figure 17). [5+5]

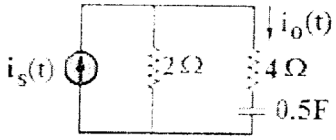

Figure: 17

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