

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 $V_{ab} = 240 \text{ V} \angle 15^\circ$ for the circuit shown figure 1 below, what is the value of I_{ab} . [3M]

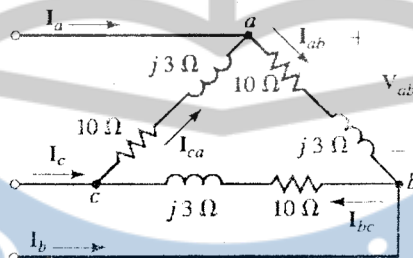


Figure: 1

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

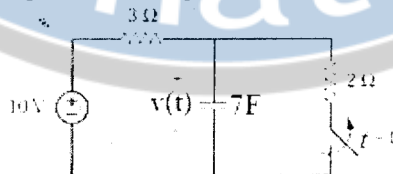


Figure: 2

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]

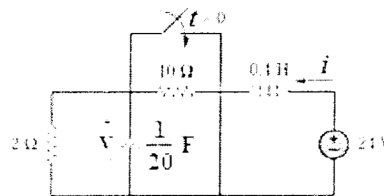


Figure: 3

e) A function is given by $Z(s) = \frac{2s}{s^2 + 16}$. 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 $I_{AC} = 10 \angle -30^\circ$ A:
- Determine the three line currents assuming that the circuit operates in the positive phase sequence.
 - Calculate the load impedance if the line voltage is $V_{AB} = 110 \angle 0^\circ$ 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 V_{ab} as reference.

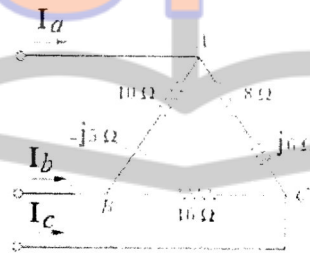


Figure: 4

- 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.

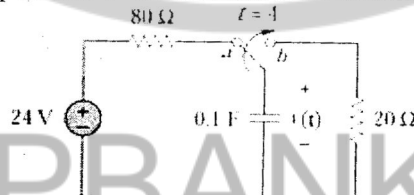


Figure: 5

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

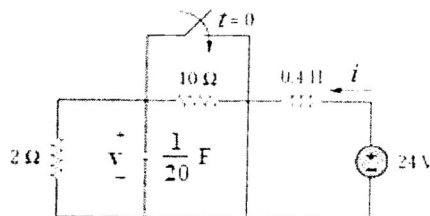


Figure: 6

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.

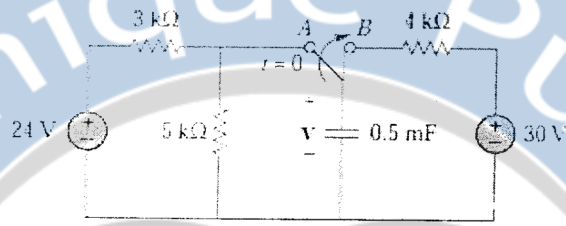


Figure: 7

- 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]

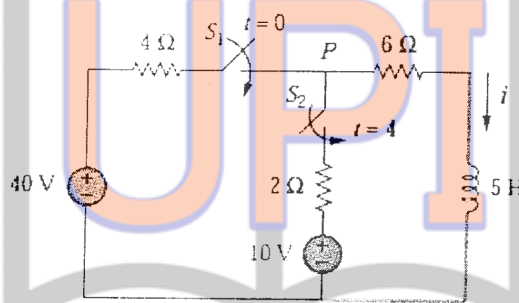


Figure: 8

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

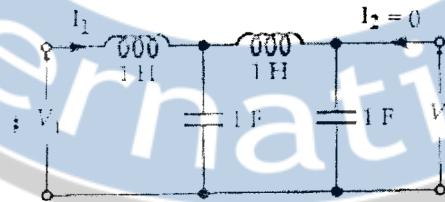


Figure: 9
OR

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

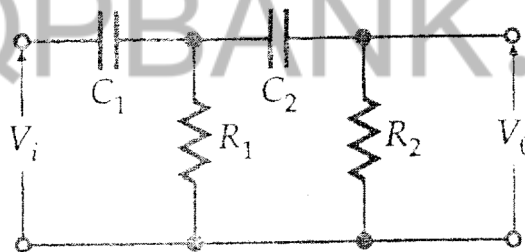


Figure: 10

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

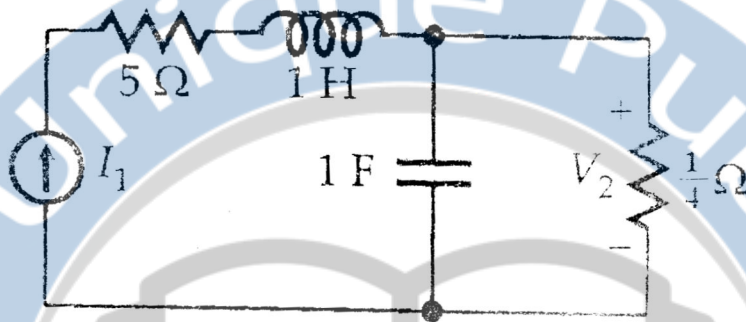


Figure: 11

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

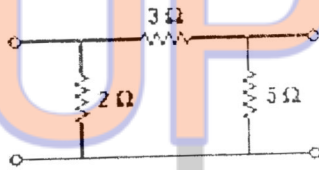


Figure: 12

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]

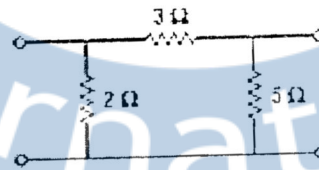


Figure: 13
OR

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

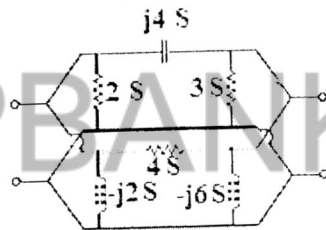


Figure: 14

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

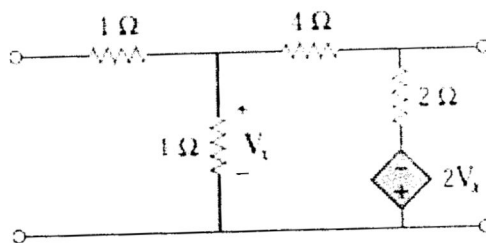


Figure: 15

- 10.a) A filter section is to have a characteristic impedance at zero frequency of 600Ω 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]

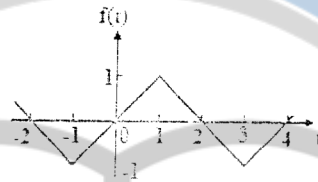


Figure: 16
OR

- 11.a) A filter is required to pass all frequencies above 25 kHz and to have a nominal impedance of 600Ω . 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]

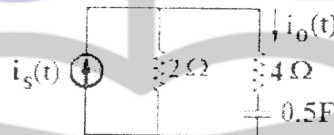


Figure: 17

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