

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER-III (NEW) • EXAMINATION – SUMMER 2015

Subject Code: 2130901

Date: 09/06/2015

Subject Name: Circuits and Networks

Time: 02:30 pm – 05:00 pm

Total Marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Explain the terms: **07**
(i) Linear (ii) Bilateral (iii) Passive (iv) Reciprocal (v) Time invariant
(vi) Oriented graph and (vii) Tree.
- (b) Justify: the current in an inductor and voltage across a capacitor cannot change **07**
instantaneously.
- Q.2** (a) State and explain maximum power transfer theorem. Also derive the condition for **07**
maximum power transfer to the load for DC and AC circuit.
- (b) Using mesh analysis determine mesh current i and the value of k which causes $i=0$ **07**
if $V_1=10$ v and $V_2=2$ v for the network shown in figure 1.
- OR**
- (b) Using nodal analysis find the value of k such that V_y is zero for the network shown **07**
in figure 2.
- Q.3** (a) What is significance of initial condition? Write initial conditions for R , L and C at **07**
 $t=0_+$ and at $t=\infty$.
- (b) For the network shown in figure 3 the switch k is closed at $t=0$, also it reaches a **07**
steady state with the switch k open. Find the current $i(t)$ for all time.
- OR**
- Q.3** (a) What is time constant? Explain time constant in terms of RL and RC circuit. **07**
- (b) Determine $V_b(0_+)$ and $V_b(\infty)$ for the network shown in figure 4, which reaches to **07**
steady state with switch k open and at $t=0$, the switch k is closed.
- Q.4** (a) Explain concept of poles and zeros and their significance in network functions. **07**
- (b) Find the h parameters for the network shown in figure 5. **07**
- OR**
- Q.4** (a) Find Laplace transform of $f_1(t)=\cos \omega t$ and $f_2(t)=e^{-at}\sin \omega t$. **07**
- (b) For the network shown in figure 6 determine voltage transfer gain $G_{12}=V_2/V_1$. **07**
- Q.5** (a) Derive relationship between incidence matrix (A), fundamental tie-set matrix (B_f) **07**
and fundamental cut-set matrix (Q_f).
- (b) Find the Z parameters for the network shown in figure 7. **07**
- OR**
- Q.5** (a) Derive expression of h parameter in terms of Z and Y parameters. **07**
- (b) For the network shown in figure 8 draw the oriented graph. Also obtain incidence **07**
matrix (A), fundamental tie-set matrix (B_f) and fundamental cut-set matrix (Q_f).

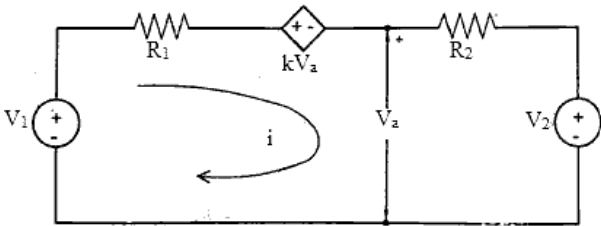


Figure 1

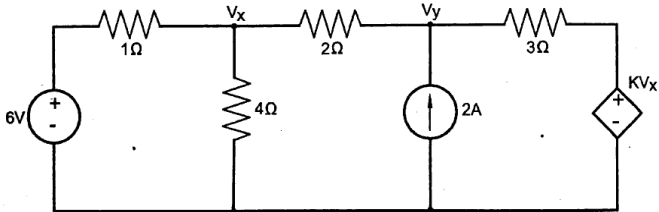


Figure 2

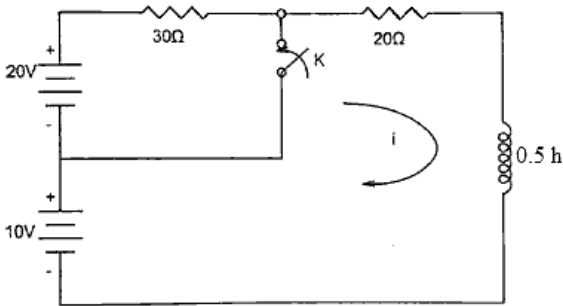


Figure 3

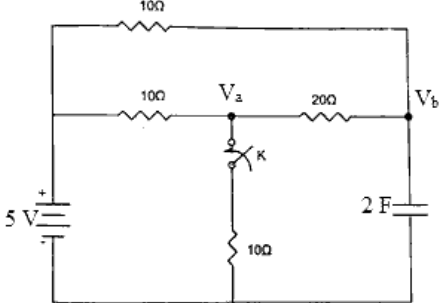


Figure 4

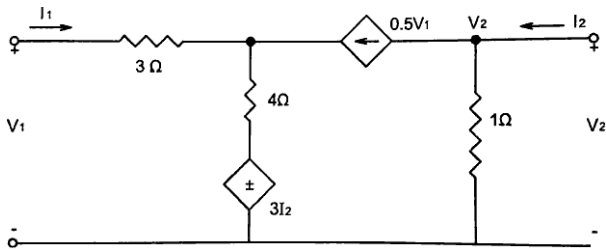


Figure 5

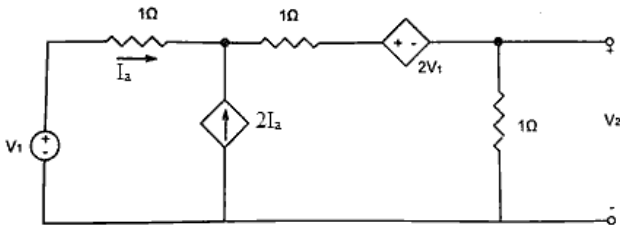


Figure 6

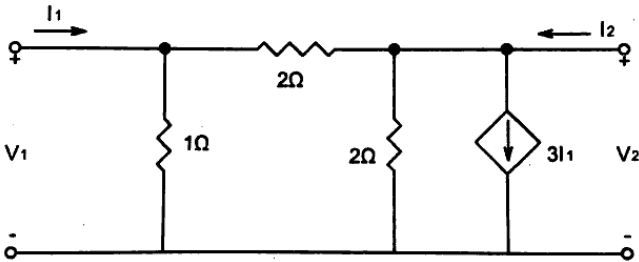


Figure 7

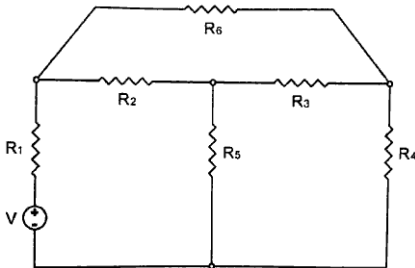


Figure 8