

GUJARAT TECHNOLOGICAL UNIVERSITY**BE SEM-III Examination-Dec.-2011****Subject code: 130901****Date: 24/12/2011****Subject Name: Circuits and Networks****Time: 2.30 pm -5.00 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) (i)** Find V_x using node analysis for the network in Fig.1 **03**
(ii) A series RLC circuit with zero inductor current and zero capacitor voltage is excited by 50V dc source, find $i(0^+)$ and $di(0^+)/dt$. Take $R=20\Omega$, $C=10\mu F$, $L=1H$. **04**
- (b)** State KVL and find loop currents i_1 , i_2 and i_3 using loop analysis for the network in Fig.2. **07**
- Q.2 (a)** In a series RLC circuit of Fig.3 $v(t) = 6 e^{-2t}$ volts. switch K is closed at $t = 0$. find current $i(t)$ using laplace transformation method. Assume zero initial conditions. **07**
- (b) (i)** Derive Laplace transform of derivatives and integrals. **05**
(ii) Find Laplace transform of $\cos\omega t$. **02**
- OR**
- (b)** Describe Laplace transformation method for solving differential equations, state its advantage over the classical method. **07**
- Q.3 (a)** Using super position theorem find voltage V_x for the network shown in Fig.4. **07**
(b) Find Z parameter for the two port network shown in Fig.5 **07**
- OR**
- Q.3 (a)** State thevenin's theorem, find R_{th} and V_{th} for the network shown in Fig.6 **07**
(b) Find ABCD parameter for the two port network shown in Fig.7 **07**
- Q.4 (a)** Explain duality and find equivalent dual network of the circuit given in Fig.8 **07**
(b) In the network of Fig.9 a steady state is reached with switch K open. At $t=0$ switch is closed, for the element values given determine $v_a(0^-)$, $v_a(0^+)$. **07**
- OR**
- Q.4 (a)** State and explain (i) Reciprocity theorem (ii) Norton's Theorem. **07**
(b) (i) Draw transform representation in terms of impedance for inductor with initial current. **02**
(ii) For the circuit in Fig.10 switch K is moved from position a to b at $t = 0$, having been in position a for long time before $t=0$. capacitor C2 is uncharged initially, Find particular solution for $i(t)$ and $v_2(t)$ for $t > 0$. **05**
- Q.5 (a)** Explain incident matrix of a linear oriented graph with example. **07**
(b) For the network shown in Fig.11 all sources are time invariant, find the branch current I using source transformation method. **07**
- OR**
- Q.5 (a)** Explain circuit matrix of a linear oriented graph and kirchhoff's laws in fundamental circuit matrix formulation. **07**
(b) Discuss dot convention of coupled coils and write kirchhoff's voltage law equations for the network in Fig.12 **07**

FIGURES - Subject code: 180301
circuits & networks.

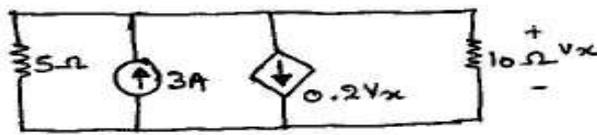


Fig. 1 Q.1(a)(i)

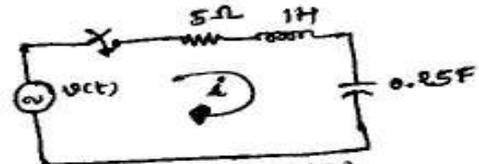


Fig. 3 Q.2(a)

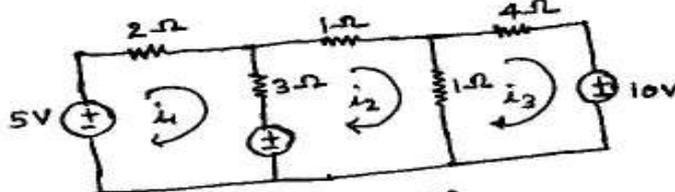


Fig. 2 Q.1(b)

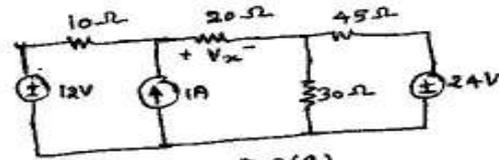


Fig. 4 Q.3(a)

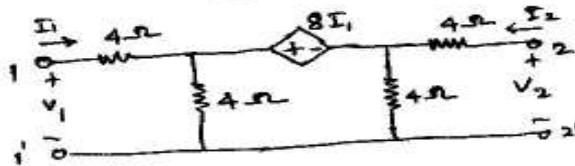


Fig. 5 Q.3(b)

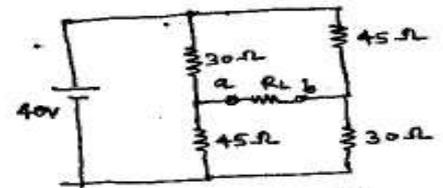


Fig. 6 Q.3(a) OR

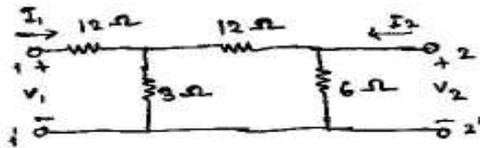


Fig. 7 Q.3(b) OR.

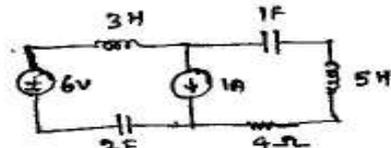


Fig. 8 Q.4(a)

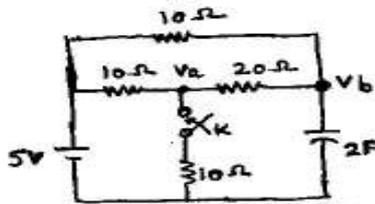


Fig. 9 Q.4(b)

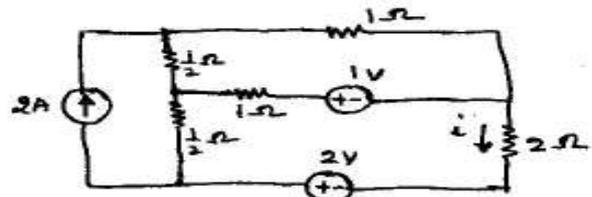


Fig. 11 Q.5(b)

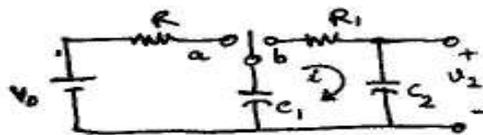


Fig. 10 Q.4(b) OR.

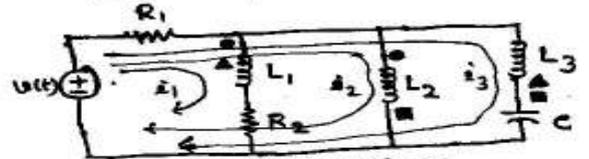


Fig. 12 Q.5(b) OR.