

GUJARAT TECHNOLOGICAL UNIVERSITY**B.E. Sem-III Regular / Remedial Examination December 2010****Subject code: 130901****Subject Name: Circuits and Networks****Date: 14 /12 /2010****Time: 10.30 am – 01.00 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 (i) Linear (ii) Bilateral (iii) Passive (iv) Reciprocal (v) Time invariant (vi) Lumped parameter and (vii) Dual with reference to Network. **07**
- (b) Write down voltage and current relationships in resistor, inductor and capacitor. Obtain these relationships in “s” domain also. State assumptions if any in obtaining the relationship. **07**
- Q.2** (a) (i) Explain about voltage sources and current sources. Include ideal, practical, independent and dependent sources in your explanation. **04**
- (ii) Using Nodal analysis find voltage V_1 and V_2 for the circuit shown in Figure 1. **03**
- (b) Explain in brief about source transformation and Find Norton’s equivalent circuit for the network shown in Figure 2 and obtain current in 10Ω resistor. **07**
- OR**
- (b) Obtain Thevenin’s equivalent circuit for the network shown Figure 3 and find the power dissipated in $R_L = 5\Omega$ resistor. Find R_L for maximum power transfer from the source and compute maximum power that can be transferred i.e. P_{max} . **07**
- Q.3** (a) Find the voltage across $1K\Omega$ resistor in the circuit shown in Figure 4, using superposition theorem. **07**
- (b) Obtain the response $V_C(t)$ and $i_L(t)$ for the source free RC and RL circuits respectively. Assume initial voltage V_0 and initial current I_0 respectively. **07**
- OR**
- Q.3** (a) For the circuit shown in Figure 5, the switch “S” is at position “1” and the steady state condition is reached. The switch is moved to a position “2” at $t = 0$. Find the current $i(t)$ in both the cases, i.e. with switch at position 1 and switch at position 2. **07**
- (b) How do one classify that the given circuit is of first order or second order? Obtain second order circuit models for series RLC and parallel RLC circuits in time domain and in “s” domain. **07**
- Q.4** (a) Obtain the Laplace Transform for $f_1(t)=t$ and $f_2(t)= te^{-at}$ **07**
- (b) State the final value theorem of Laplace Transform and find the final value of the function $f(t) = 5u(t) + 10e^{-t}$ using final value theorem. Under what conditions the final value theorem cannot be used ? Give one example. **07**
- OR**
- Q.4** (a) What is an impulse function ? For the network function $H(s)$ given below, Find the impulse response $h(t)$. **07**
- $$H(s) = \frac{1}{s^2 + 4s + 1}$$
- (b) Obtain currents $I_1(s)$, $I_2(s)$ and $V_0(s)$ for circuit shown in Figure 6. **07**

- Q.5 (a)** Find Z- parameters for the network shown in Figure 7. **07**
(b) Explain about hybrid parameters for two port network and state where do one make use of these parameters. **07**

OR

- Q.5 (a)** ABCD parameters are also known as transmission parameters and they are derived from the basic two port network parameters. Show that, for reciprocal linear time invariant two port network, $AD-BC=1$. **07**
(b) Explain about linear oriented graph, Incidence Matrix and Circuit Matrix. Show Kirchoff's Laws in Incidence Matrix formulation and Circuit Matrix formulation. **07**

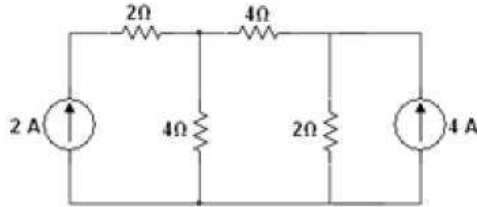


Figure: 1

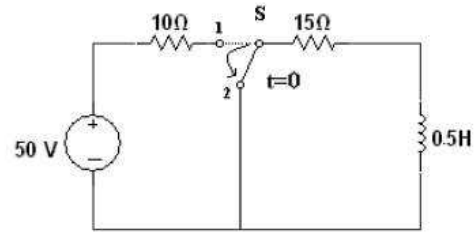


Figure: 5

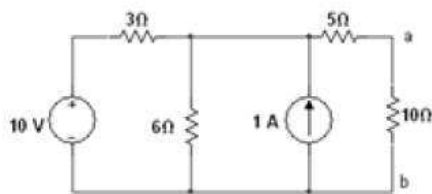


Figure: 2

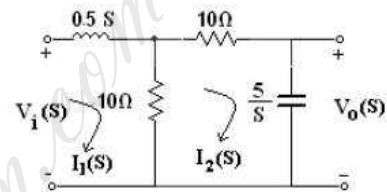


Figure: 6

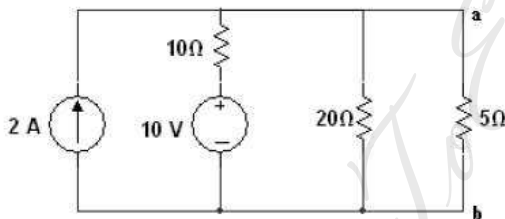


Figure: 3

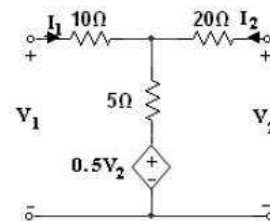


Figure: 7

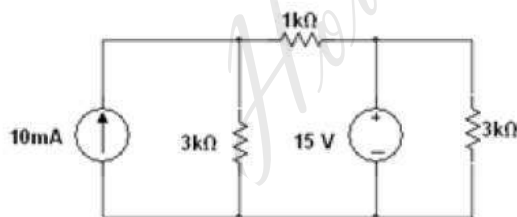


Figure: 4