

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-III • EXAMINATION – WINTER 2013

Subject Code: 130901

Date: 07-12-2013

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)** The switch in the circuit shown in figure-1 has been in position ‘a’ for a long time and $v_2 = 0V$. At $t=0$, the switch is thrown to position ‘b’. Calculate; **07**
- a) i, v_1 and v_2 for $t \geq 0^+$
 - b) The energy stored in capacitor at $t=0$
 - c) The energy dissipated in the $5k\Omega$ resistor, if switch remains in position ‘b’ indefinitely.
- (b)** Derive formulae to convert given ‘Y’ parameters into ‘h’ parameters. **07**
- Q.2 (a)** Find the ‘Z’ parameters for the two port network shown in figure-2. Also find v_2 when $v_g = 50u(t)V$. **07**
- (b)** Show that two magnetically coupled coils connected in parallel can be replaced by a single coil having an inductance of (a) $L_{ab} = \frac{L_1L_2 - M^2}{L_1 + L_2 - 2M}$ (b) if magnetic polarity of the coil 2 is reversed then $L_{ab} = \frac{L_1L_2 - M^2}{L_1 + L_2 + 2M}$ **07**
- OR**
- (b)** In the circuit shown in figure-3 the voltage and current expressions are $v = 100e^{-1000t}V, t \geq 0$ and $i = 5e^{-1000t}mA, t \geq 0$ Find; **07**
- a) R, C and τ (in milliseconds)
 - b) The initial energy stored in the capacitor
 - c) Time required to dissipate 80 % of the initial energy stored in the capacitor (micro seconds).
- Q.3 (a)** Assuming batteries to be ideal voltage sources in figure-4, find the current in R_L using the concept of source transformation. **07**
- (b)** Discuss substitution theorem and steps for solution of a network using this theorem. **07**
- OR**
- Q.3 (a)** 1. The voltage and current in the circuit element is $v = 100 \cos(377t - 80^\circ)V, i = 10 \cos(377t + 10^\circ)A$. Identify elements and obtain its value. **07**
2. What is the power loss in 5Ω resistor of figure-5?
- (b)** Find the current in 6Ω resistor in figure-6 using Thevenin’s theorem. Verify your result using Norton’s theorem. **07**
- Q.4 (a)** For the circuit shown in figure-7 find the power loss in 0.5Ω and 1Ω resistor. Check power balance in the circuit. **07**
- (b)** Discuss concept of poles and zeros in a network function. **07**
- OR**
- Q.4 (a)** Find V_o in figure-8. **07**
- (b)** Find out (1) input impedance function and (2) $V_{o(s)}/V_{i(s)}$ in the figure-9. **07**
- Q.5 (a)** Explain formation of incidence matrix with suitable example. Give properties of incidence matrix. **07**
- (b)** Draw the dual of the network shown in figure-10. **07**

OR

- Q.5 (a) With reference to figure-11, draw the graph and write down the tie-set matrix. 07
 (b) Establish relationship between fundamental cut-set matrix Q_f , fundamental tie-set matrix B_f and reduce incidence matrix A . 07

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