Seat No.: _____ Enrolment No._____

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 $v_2 = 0\ V$. 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 5kΩ 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 **07**
$v = 100e^{-1000t}\ V, t \geq 0$
$i = 5e^{-1000t}\ mA, t \geq 0$ Find;

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 $v = 100\cos(377t - 80^0), i = 10\cos(377t + 10^0)$. 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 0.5 Ω 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 Vo in figure-8. **07**

(b) Find out (1) input impedance function and (2) $V_{0(s)}/V_{s(s)}$ 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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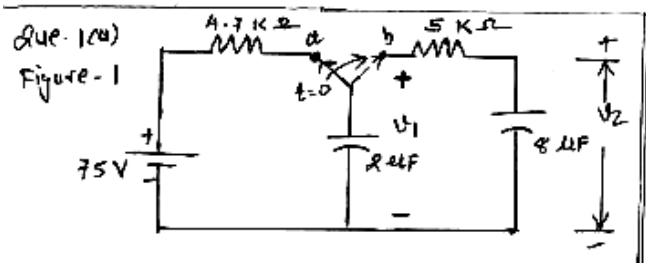
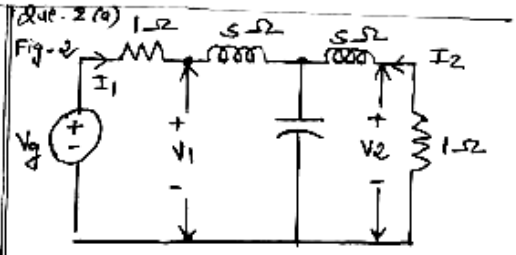
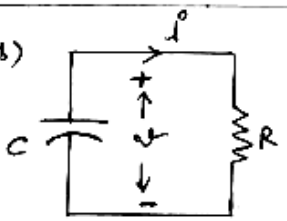
Que. 1(a)
Figure - 1



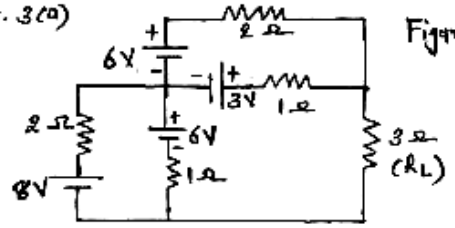
Que. 2(a)
Fig-2



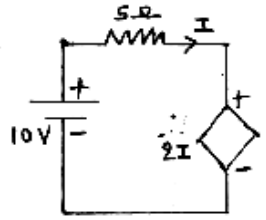
OR
Que. 2(b)
Fig-3



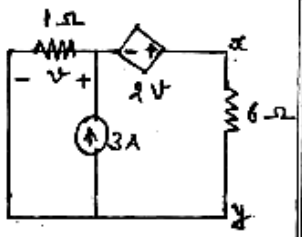
Que. 3(a)
Figure-4



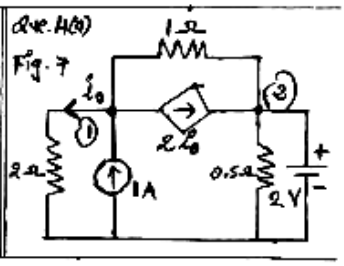
OR
Que. 3(a).
(c)
Fig-5



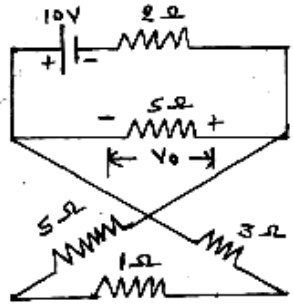
OR
Que. 3(b)
Fig-6



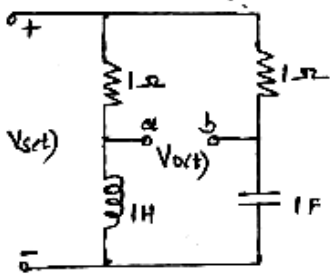
Que. 4(a)
Fig-7



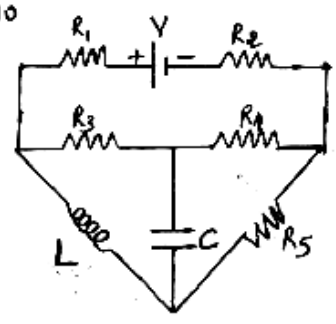
OR Que. 4(a)
Fig-8



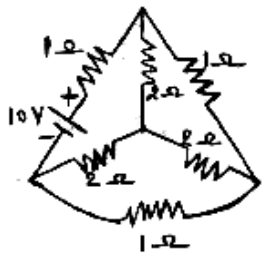
OR
Que. 4(b)
Fig-9



Que. 5(b)
Fig-10



OR Que. 5(a)
Fig-11



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