Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III(OLD) • EXAMINATION – WINTER 2016

Subject Code:130901 **Date:04/01/2017**

Subject Name:Circuits and Networks

Time:10:30 AM to 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)** Define Kirchhoff's Current Law and determine all mesh currents of a network which is shown in Figure – 1. **07**

(b) Define Kirchhoff's Voltage Law and determine current i in the network using node voltage analysis. The network is shown in Figure – 2. **07**

Q.2 **(a)** State the Norton's Theorem. Show the mathematical steps to find out the load current of given network using Norton's theorem. **07**

(b) Determine current passing through ammeter (R_A= 2 ohm) connected in the whetstone bridge. Use Thevenin's Theorem for the electrical network shown in Figure 3. **07**

OR

(b) For the network shown in Figure – 4, determine the value of R_L to that will cause the power in R_L to have maximum value. What will be the value of power under this condition? **07**

Q.3 **(a)** Using definition, determine the Laplace transform of the following time domain functions. **07**

(1) $f(t) = t^3$

(2) $f(t) = \sinh(wt)$

(b) Explain the significance of poles and zeros. Determine the poles and zeros of the following function and show the plot pole-zero diagrams for the same. **07**

OR

Q.3 **(a)** Find $i(0^+)$, $di/dt(0^+)$ and $d^2i/dt^2(0^+)$ for the network shown in Figure – 5. The switched is moved from position 1 to position 2 at t=0. **07**

(b) Prove the following property of Laplace Transform. **07**

$$1.\ L\left[\frac{df(t)}{dt}\right] = sX(s - x(0)$$

$$2.\ L\left[\int_0^t x(t)dt\right] = \frac{X(s)}{s}$$

Q.4 **(a)** State Millman's Theorem. Prove this theorem with considering electrical network. **07**

(b) Figure – 6 shows mutually coupled network. Draw the dot equivalent network and write the KVL equations for the same. **07**

OR

Q.4 **(a)** Determine the step (DC) response of R-C series circuit. Also draw the current transient response curve for the same. **07**

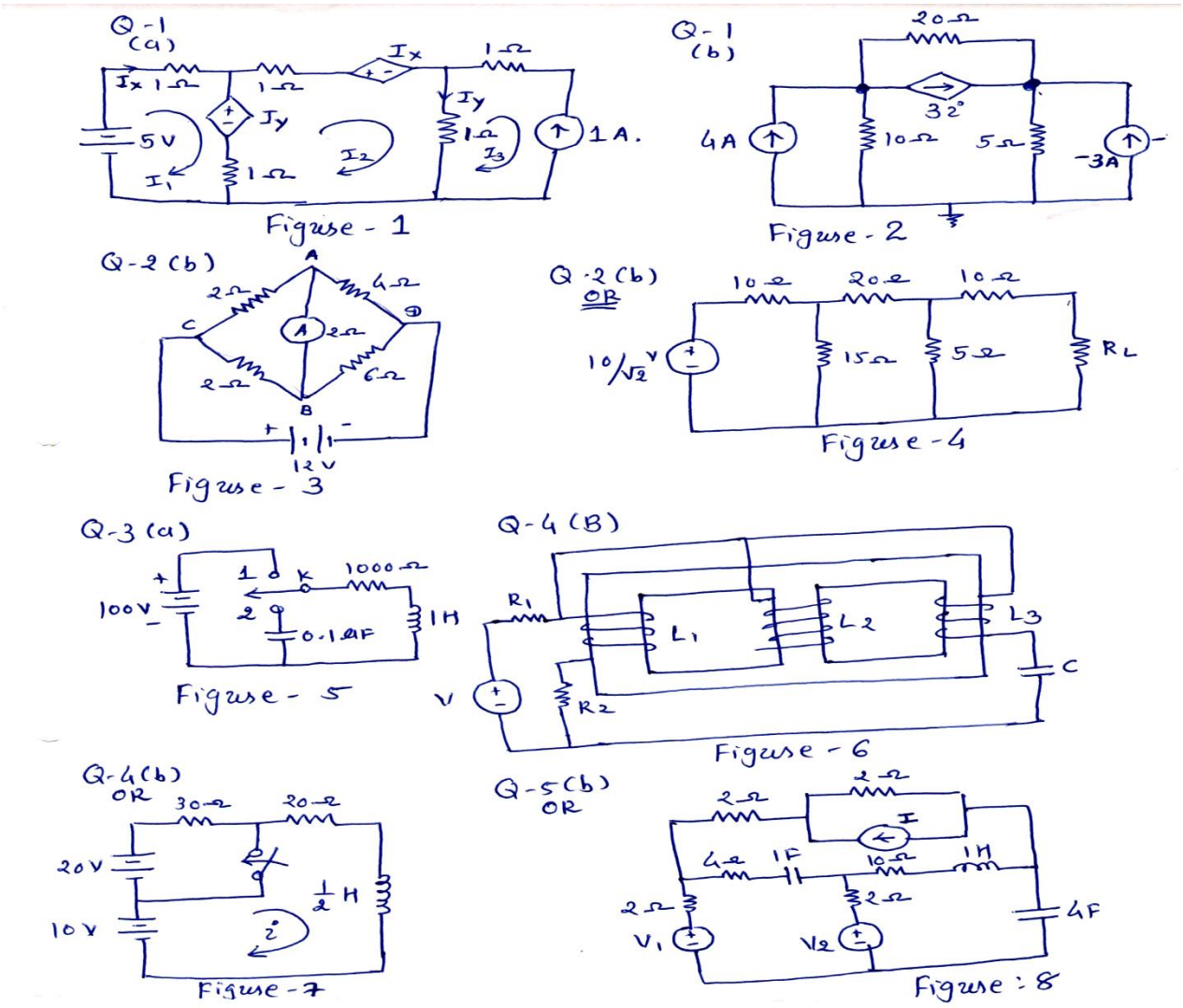
(b) In the network of Figure 7, a steady state is reached with the switch K open. At t=0, the switch is closed. Determine i(t) for t>0. **07**

Q.5 **(a)** Explain the procedure to find out ABCD parameters of any given two port network. Also discuss the significance of each parameter. **07**

(b) Derive the relationship between Z parameters in terms of Y Parameters for two port network. **07**

OR

Q.5 **(a)** Define the following terms. **07**

1. Oriented Graph
2. Sub graph
3. Tree
4. Twigs
5. Links
6. Co-tree

(b) For the network shown in Figure – 8, draw the oriented graph and write (i) Incidence matrix (ii) tieset matrix and (iii) f-cutset matrix. Also draw the oriented graph. **07**