

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-III (NEW) - EXAMINATION – SUMMER 2018

Subject Code:2130901

Date:21/05/2018

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 following terms: (a) Linear and Nonlinear Networks (b) Lumped and Distributed Networks **03**
(b) Construct the exact dual of the network of figure:1. **04**
(c) In the network of figure:2, determine the i_2 using Source Transformation method. **07**

- Q.2** (a) Determine the inductance between the terminals for a 3 coil shown in figure:3. **03**
(b) Find the voltage drop across x-y for figure:4. **04**
(c) Find the value of V_x in the circuit of figure:5, using mesh analysis. **07**

OR

- (c) In the network of figure:6, determine the node voltages V_1, V_2, V_3 using node analysis. **07**
- Q.3** (a) What is time constant? What is its significance? **03**
(b) How the following elements will behave at $t = 0$ and $t = \infty$. Draw the equivalent network as well. (a) Inductor (b) Capacitor. **04**
(c) For the network shown in figure:7, the switch k is open for a long time and closed at $t = 0$. Determine $v_c(t)$. **07**

OR

- Q.3** (a) Derive Laplace Transform of $f(t) = tu(t)$. **03**
(b) In the circuit shown in figure:8, voltage and current expressions are $v(t) = 100e^{-1000t}V, t \geq 0$ and $i(t) = 5e^{-1000t}mA, t \geq 0$. Find (a) R, C and Time Constant (τ). (b) Initial energy stored in capacitor. **04**
(c) In a network of figure:9, a steady state is reached with the switch k open. At $t=0$, the switch is closed. Determine the values of $v_a(0^-)$ and $v_a(0^+)$. **07**

- Q.4** (a) State and explain superposition's theorem. **03**
(b) Using Laplace transformation, solve the following differential equation. **04**
 $\frac{d^2i}{dt^2} + 4\frac{di}{dt} + 8i = 8u(t)$. Given that $i(0^+) = 3$ and $\frac{di}{dt}(0^+) = -4$.
(c) Find the Norton's equivalent circuit across terminals AB of the circuit shown in figure:10. **07**

OR

- Q.4** (a) State and explain Maximum Power Theorem. **03**
(b) Explain and derive the step response to R-L series circuit using Laplace Transformation method. **04**
(c) Find the Thevenin's equivalent network across the terminals A and B for figure:11. **07**

- Q.5** (a) Write equations of Short circuit Admittance and Open Circuit Impedance parameters of a two port network. **03**
(b) Derive formulae to convert given y – parameters into h - parameters. **04**
(c) For the network of figure: 12, find the z and y parameters. **07**

OR

- Q.5 (a) Explain the following terms: (a) Tree (b) Mesh (c) Graph. 03
 (b) State the procedure to obtain solution of a network using Laplace Transform method. State advantages of Laplace method over classical method. 04
 (c) For the circuit shown in figure:13, draw the oriented graph and write the (a) incidence matrix (b) f- cutset matrix and (c) tieset matrix. 07

