

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 ($R_A = 2 \text{ ohm}$) 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) $f(t) = t^2$
- (2) $f(t) = \sin(2t)$

(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 switch is moved from position 1 to position 2 at $t=0$. **07**

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

$$\lim_{t \rightarrow \infty} \left| \frac{d^2 f(t)}{dt^2} \right| = s^2 X(s) - s f(0) - f'(0)$$
$$\lim_{t \rightarrow \infty} \left| \int_0^t f(t) dt \right| = \frac{X(s)}{s}$$

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**

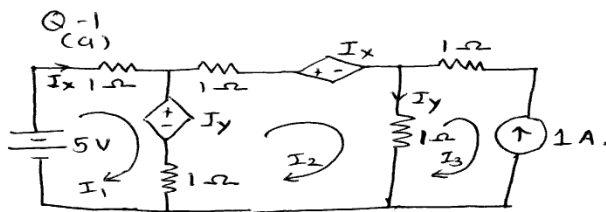


Figure - 1

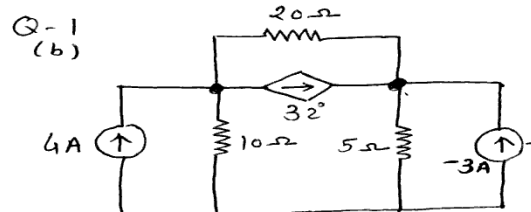


Figure - 2

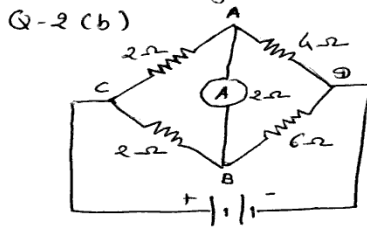


Figure - 3

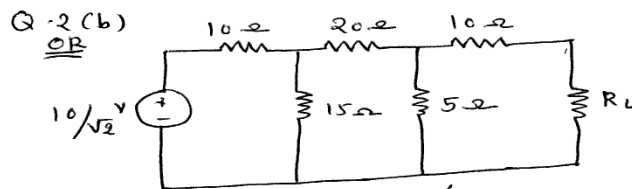


Figure - 4

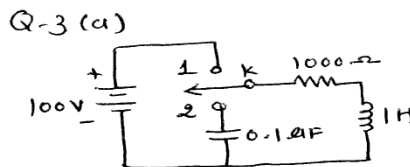


Figure - 5

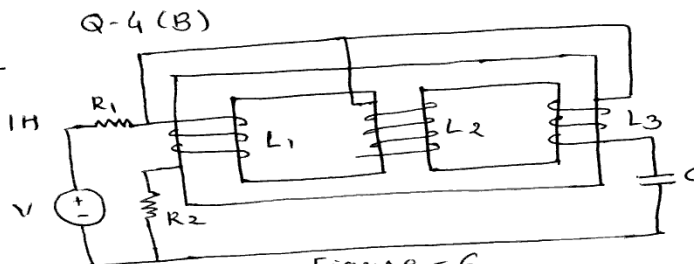


Figure - 6

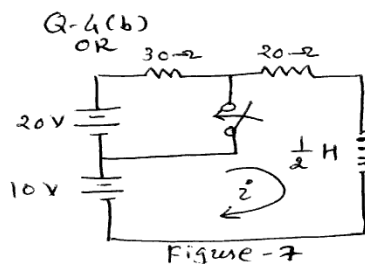


Figure - 7

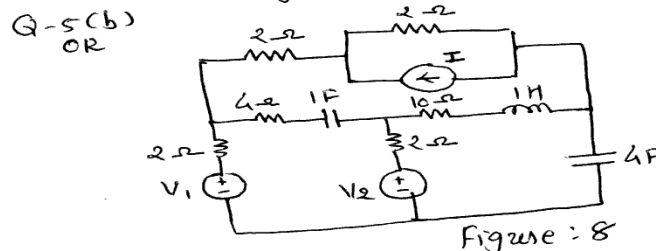


Figure : 8