Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

B.E. Sem-III Examination December 2009

Subject code: 130901 **Subject Name: Circuits and Networks**

Date: 19 / 12 /2009 **Time: 11.00 am – 1.30 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)** State and explain (i) Thevenin's theorem and (ii) Norton's theorem in brief giving suitable examples. **06**

(b) What are Y-parameters and Z-parameters? Derive the expression for Z parameters in terms of Y parameters and vice versa. **06**

(c) How inductor and capacitor will behave at t = 0 and at t = ∞. Draw equivalent networks. **02**

Q.2 **(a)** What is duality? Prepare a list of dual quantities encountered in electrical engineering. Describe the procedure to draw dual of a network. **07**

(b) Determine the current through 4Ω resistor branch of the network given in **Fig 1.** using mesh analysis **07**

OR

(b) In the network of **Fig.2** using node analysis find V_2 which results in zero current through 4Ω resistor. **07**

Q.3 **(a)** A network with magnetic coupling is shown in **Fig.3.** For the network $M_{12}=0$ Formulate loop equations for this network using KVL. **04**

(b) Determine the equivalent inductance at terminals A-B for circuit in **Fig.4** **02**

(c) Explain the rules for source transformation technique. For the network shown in **Fig.5** determine the numerical value of current i_2 using source transformation technique. **08**

OR

Q.3 **(a)** State and explain the maximum power transfer theorem. Derive the condition for maximum power transfer to the load for d.c. circuits. **06**

(b) For the network shown in **Fig.6** determine the value of R_L for maximum power transfer. What will be the value of power transfer under this condition? **08**

Q.4 **(a)** For the network shown in **Fig.7** switch K is closed at time t = 0 with zero inductor current and zero capacitor voltage. Solve for **10**

(i) V_1 and V_2 at $t = 0^+$

(ii) V_1 and V_2 at $t = \infty$

(iii) dV_1/dt and dV_2/dt at $t = 0^+$

(iv) d^2V_2/dt^2 at $t = 0^+$

(b) In the network of **Fig. 8** steady state is reached with switch K open. At t = 0 switch K is closed. Find i(t) for the numerical values given. **04**

OR

Q.4 **(a)** State the procedure to obtain solution of a network using Laplace transform technique. State its advantages over classical method. **06**

(b) For the circuit shown in **Fig. 9** obtain the transform of the generator current I(s). **03**

(c) A series R-L-C circuit having initially zero inductor current and zero capacitor voltage is excited by a 20V d.c. source. Find i(t). Assume R = 9Ω, L = 1H and C = 0.05F. **05**

Q.5 **(a)** What is meant by poles and zeros of network function? State its important features and explain its physical significance. **07**

(b) Obtain ABCD parameters for the network shown in **Fig. 10** **07**

OR

Q.5 **(a)** Give the definition of the following: **04**
(i) Graph (ii) Branch (iii) Node (iv) Tree

(b) Draw the graph for the circuit shown in **Fig.11.** Prepare the incidence matrix A and partition it into a matrix containing all passive branches Ap and a matrix containing independent current sources branches Ag. Formulate the branch admittance matrix Yp and hence find node admittance matrix Yn **10**

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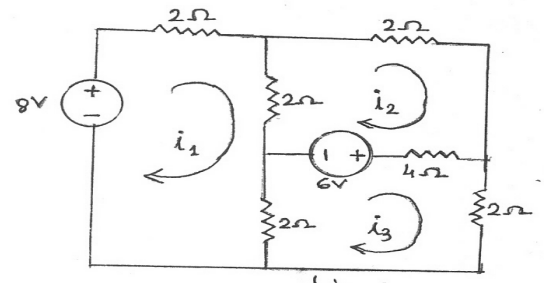

fig. 1

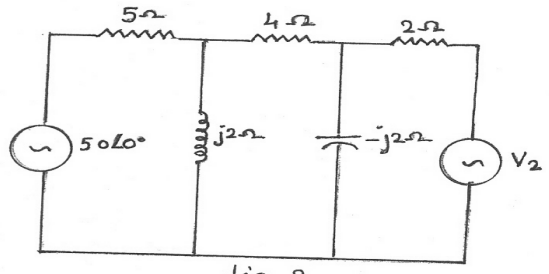

fig. 2

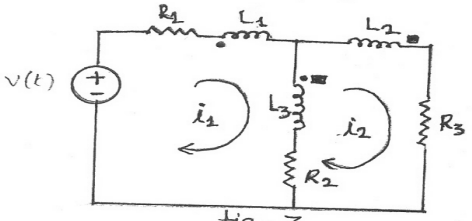

fig. 3

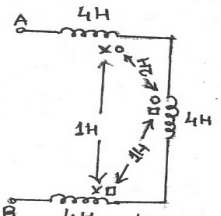

fig. 4

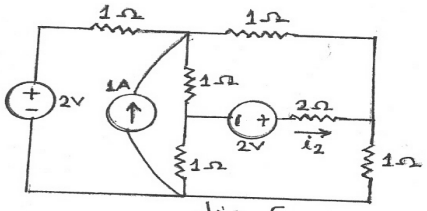

fig. 5

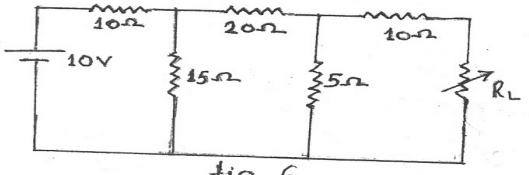

fig. 6

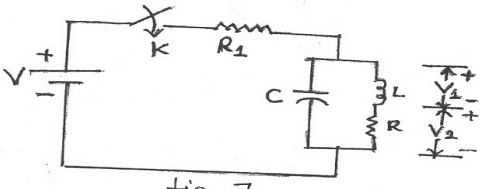

fig. 7

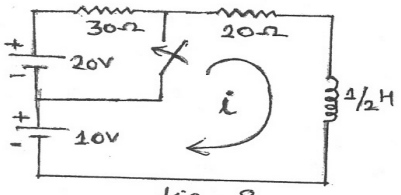

fig. 8

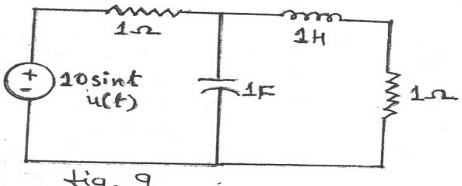

fig. 9

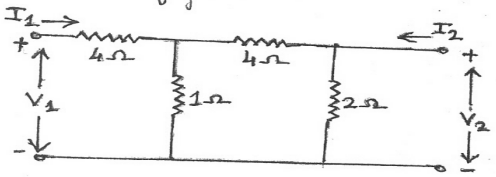

fig. 10

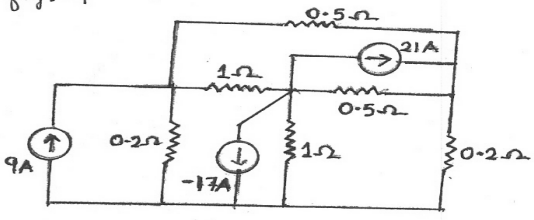

fig. 11