Seat No.: _____ Enrolment No._____

# GUJARAT TECHNOLOGICAL UNIVERSITY

**PDDC - SEMESTER–II EXAMINATION – WINTER 2015**

**Subject Code: X20901** **Date:22/12/2015**

**Subject Name: Circuits and Networks**

**Time: 02:30pm to 05:00pm** **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)** Find the currents through the resistors shown in the network of Fig. 1 using mesh analysis. **07**

**(b)** Derive formulae to convert given 'Y' parameters into 'h' parameters. **07**

**Q.2** **(a)** For the network shown in Fig. 2, determine the numerical value of the current $I_1$. **07**

**(b)** In the network of Fig. 3, the switch 'k' is changed from position 1 to position 2 at t=0. Find values of $i, \frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at t=0+. If R=1000Ω, L= 1 H, C=0.1 μF and V=100 V. **07**

**OR**

**(b)** In the network of Fig. 4, the switch 'k' is opened at t=0. Find values of v, $\frac{dv}{dt}$ and $\frac{d^2v}{dt^2}$ at t=0+. If I=10 A, R=10Ω, L= 1 H. **07**

**Q.3** **(a)** 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**

**(b)** Discuss Thevenin's theorem and steps for solution of a network using this theorem. **07**

**OR**

**Q.3** **(a)** Find the current I flowing through 3 Ω resistor in the network of Fig. 5. Given that wL=1 and wC=1. **07**

**(b)** Discuss concept of poles and zeros in a network function. **07**

**Q.4** **(a)** Explain formation of incidence matrix with suitable example. Give properties of incidence matrix. **07**

**(b)** Obtain the 'z' parameter for the network shown in Fig. 6. Find whether the network is (a) reciprocal (b) symmetrical **07**

**OR**

**Q.4** **(a)** Establish relationship between fundamental cut-set matrix $Q_f$, fundamental tie-set matrix $B_f$ and reduce incidence matrix A. **07**

**(b)** Obtain the 'y' parameter for the network shown in Fig. 6. Find whether the network is (a) reciprocal (b) symmetrical **07**

**Q.5** **(a)** In the network shown in Fig. 7, the switch 'k' is moved from position 'a' to position 'b' at time t=0, the steady state having previously established. Find the current $i_{(t)}$ for $t \geq 0$ using Laplase transformation technique. **07**

**(b)** Define and explain (1) Tree (2) Co-tree (3) Planar Graph (4) Non-Planar graph. **07**

**OR**

**Q.5** **(a)** Explain initial and final value theorem. **07**

**(b)** For the circuit shown in Fig. 8, draw the oriented graph and write the (1) incidence matrix (2) **07**

cut-set matrix and (3) tie set matrix.

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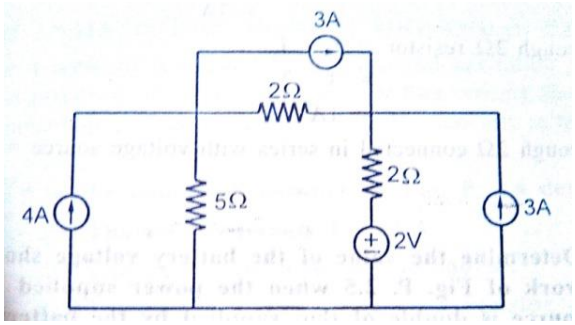
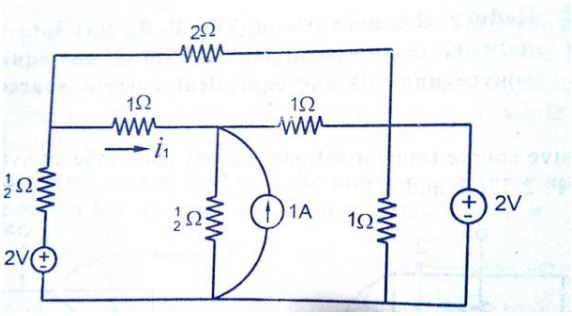
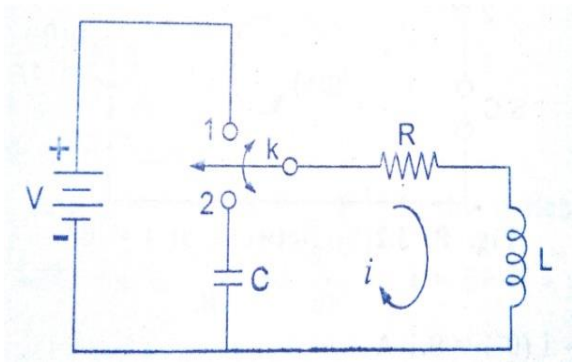
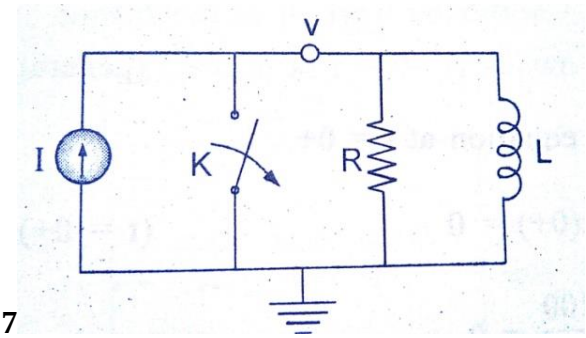
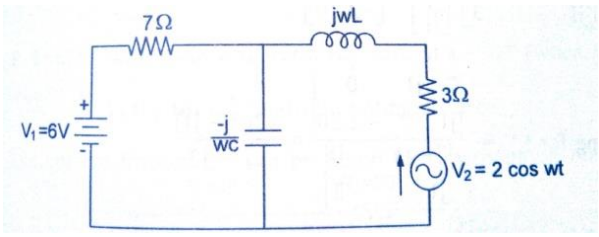
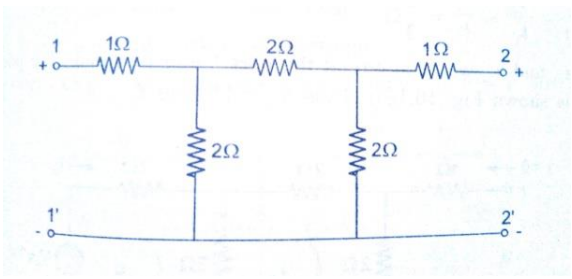
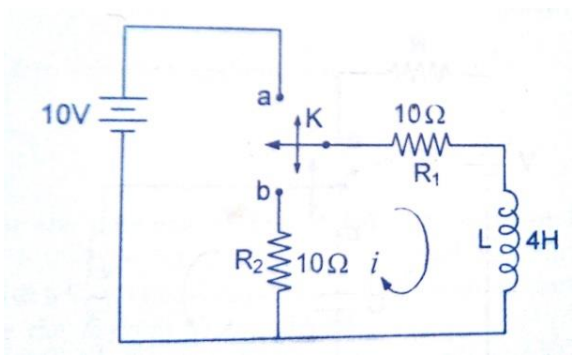
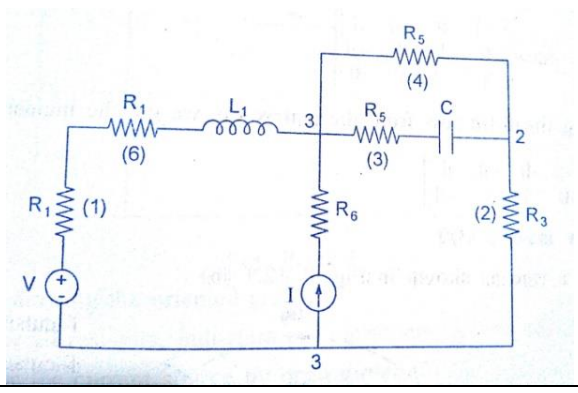
| Fig. 1 | Fig. 2 |
|---|---|
|  |  |
| **Fig. 3** | **Fig. 4** |
|  |  |
| **Fig. 5** | **Fig. 6** |
|  |  |
| **Fig. 7** | **Fig. 8** |
|  |  |