**B. Tech. Sem – III (Biomedical Engg.) (2014 COURSE) (CBCS) :**
**WINTER - 2018**

**SUBJECT: CIRCUIT THEORY**

Day : Friday
Date : 30/11/2018

Time : 10.00 AM TO 01.00 PM
Max. Marks: 60.

**W-2018-2321**

**N.B.:**

1) All questions are **COMPULSORY.**
2) Figures to the **RIGHT** indicate full marks.
3) Draw neat labeled diagrams **WHEREVER** necessary.

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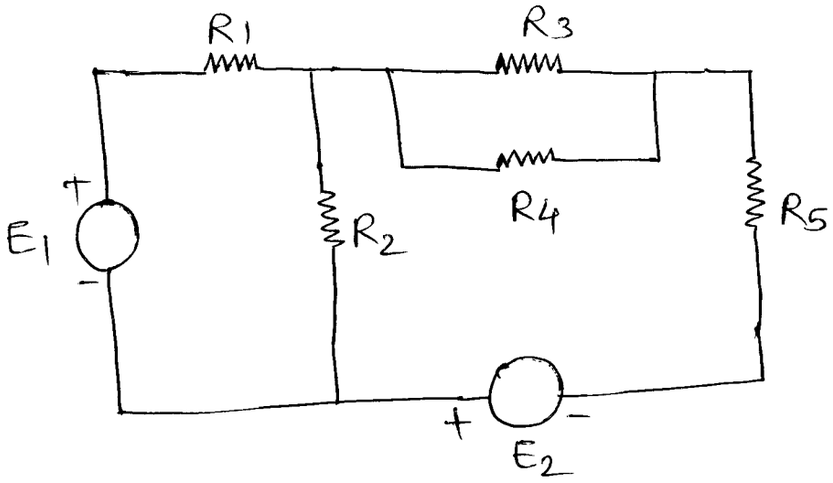
**Q.1** Find the current through $R_2$ using superposition theorem for the following figure. **(10)**

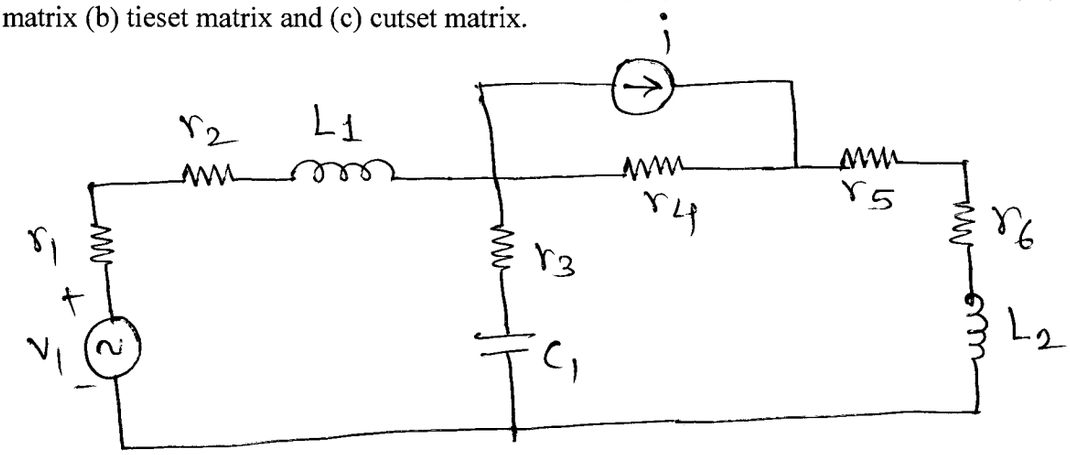



$E_1 = E_2 = 100\ V$
$R_1 = 40\ \Omega$
$R_2 = 20\ \Omega$
$R_3 = 5\ \Omega$
$R_4 = 20\ \Omega$
$R_5 = 16\ \Omega$

**OR**

State and explain Norton's and Maximum power transfer theorem. **(10)**

**Q.2** For the circuit shown in figure, draw the oriented graph and write (a) incidence matrix (b) tieset matrix and (c) cutset matrix. **(10)**




**OR**

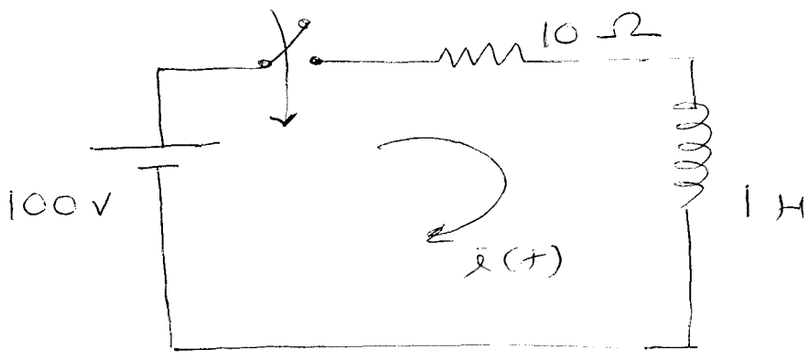
Define the following terms with examples. **(10)**
(i) Planar graph (ii) Tree (iii) Co-tree (iv) Path (v) Loop.

**Q.3** Derive the expressions for driven and undriven RL circuit. **(10)**

**OR**

**P.T.O.**

In the network shown in the figure, the switch is closed at t=0, with zero current in the inductor, find , i, $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at $t=0^+$. **(10)**




**Q.4** For series resonant circuit, derive the following expressions- **(10)**
(i) Resonant frequency (ii) Q-factor (iii) Bandwidth.

**OR**

A 50 μF capacitor, in series with a coil having 4Ω resistance, resonates at 1 kHz. Find the inductance of the coil. Also find the circuit current if the applied voltage is 10V. **(10)**

**Q.5** **a)** Explain the working of constant-k high pass filter with impedance curves and derive the expression for cut-off frequency. **(05)**

**b)** Compare m-derived filter and prototype filter. **(05)**

**OR**

Design a constant-k low pass filter to match with a line having characteristic impedance of 500 Ω and to pass frequencies up to 5 kHz. **(10)**

**Q.6** Derive the expressions for reciprocity and symmetry conditions in terms of Y and H-parameters. **(10)**

**OR**

The Z-parameters of a two port network are **(10)**
$Z_{11} = 20\Omega$, $Z_{22} = 30\Omega$, $Z_{12} = Z_{21} = 10\Omega$. Find Y and ABCD parameters.

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