Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 40432

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2021.

Second Semester

Electronics and Communication Engineering

EC 8251 – CIRCUIT ANALYSIS

(Common to Biomedical Engineering/ Electronics and Telecommunication Engineering/ Medical Electronics)

(Regulations 2017)

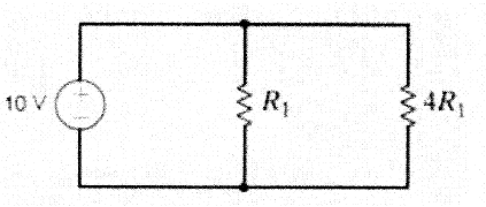
Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define the terms 'Tree' and 'Co-Tree' in the context of network theory.

2. The 10 V source in Figure is supplying 50W of power. Determine R1.



3. State the Superposition Theorem.

4. Illustrate the principle of voltage division in a series circuit with an example.

5. Define the Q-factor of a coil or circuit.

6. Mention the significance of dot rule for coupled coils.

7. A RLC series circuit is assumed to have R=10 Ω and L=2 H. Compute the value of the Capacitance that makes the circuit critically damped.

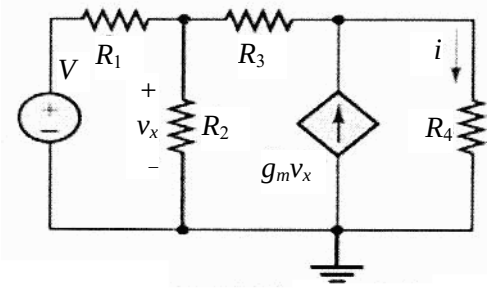
8. Distinguish Forced Response from Natural Response.

9. Draw a simple Two Port Network with necessary parameters.

10. In a two port network. $Z_{11} = 100\Omega$, $Z_{21} = 120\Omega$, $Z_{12} = 120\Omega$, $Z_{22} = 50\Omega$. Find Y parameters.

PART B — (5 × 13 = 65 marks)

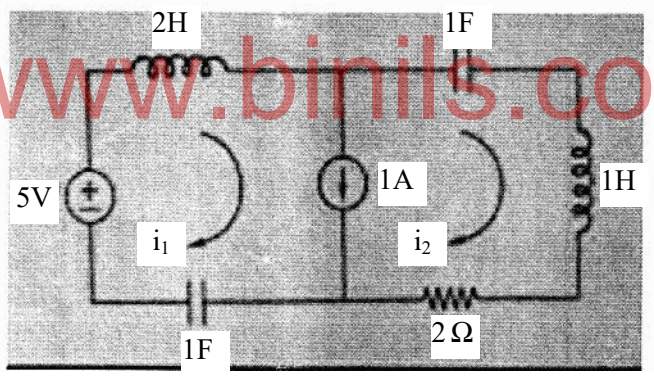
11. (a) Write the properties of a Super Mesh. Use Mesh Analysis to find the current i in the circuit yen below. Let $V = 5.6V$; $R_1 = 50\Omega$; $R_2 = 1.2\Omega$, $R_3 = 330\Omega$: gm=0.2, $R_4 = 440\ \Omega$.



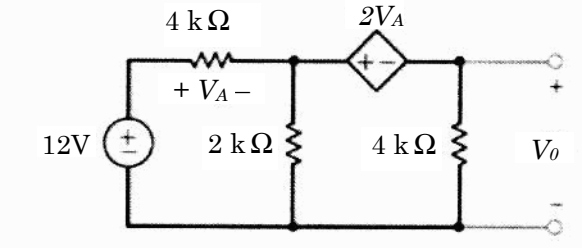
Or

(b) (i) Elucidate the concept of duality and the procedure to find the dual pairs. (7)

(ii) Draw the dual form of the circuit given below (6)

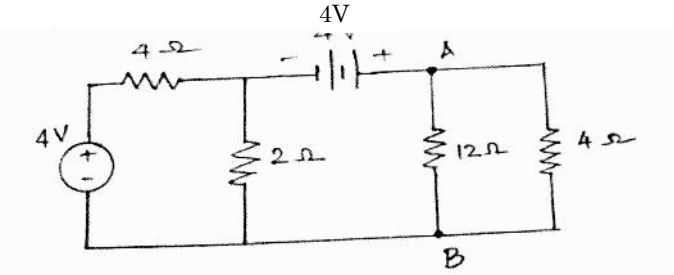


12. (a) Find V_0 in the circuit given below using Thevenin's theorem.



Or

(b) Find the voltage drop across the 12 Ω resistance using Norton's theorem for the circuit given in figure given below.



13. (a) Consider a typical Series RLC circuit that has $R = 10\Omega$, $L = 0.54\,H$ and $C = 40\mu F$. The applied voltage is 100 V. Find the following

(i) resonant frequency (2)

(ii) quality factor (2)

(iii) upper half power frequency (2)

(iv) lower half power frequency (2)

(v) bandwidth (2)

(vi) volatge across inductance at resonance (3)

Or

(b) Two identical coupled coils in series has an equivalent inductance values of 0.08 H (series aiding) and 0.03 H (series opposing). Find the values of

(i) self inductance of each coil (4)

(ii) mutual inductance (4)

(iii) co-efficient of coupling (5)

14. (a) Derive the charging and discharging capacitor voltage equations of a series RC circuit.

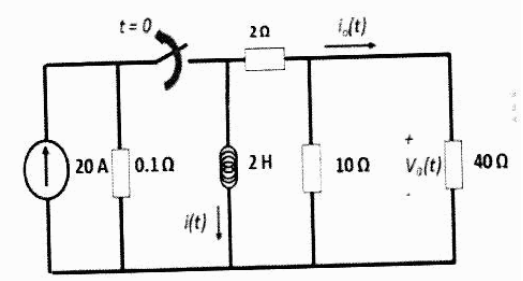
Or

(b) The switch in the circuit shown in the given figure has been closed for a long time. At time t=0, it is opened. Find.

(i) i(t) for t>0 (4)

(ii) i_0 for t>0 (4)

(iii) $V_0(t)$ for t>0 (5)



15. (a) Find the ABCD Parameters of a typical Two-Port Network.

Or

(b) Write the basic hybrid parameter equations and derive the necessary conditions of reciprocity and symmetry in terms of hybrid two-port network parameters.

PART C — (1 × 15 = 15 marks)

16. (a) A series resonance network consisting of a resistor of 50 Ω, a capacitor of 5uF and an inductor of 30 mH is connected across a sinusoidal supply voltage which has a constant output of 12 V at all frequencies. Calculate, the resonant frequency, the current at resonance, the voltage across the inductor and capacitor at resonance, the quality factor and the bandwidth of the circuit. Also sketch the corresponding current waveform and impedance waveform for all frequencies

Or

(b) Find the Thevenin's equivalent of the circuit connected to RL in Figure shown below, where $R_1 = 10\Omega$, $R_2 = 20\Omega$, $R_g = 0.1\Omega$ and $R_p = 1\Omega$. If the load resist $R_L = 5\Omega$, calculate the power dissipated across the load resistor. Verify whether the load resistor dissipates maximum power; if not, suggest a suitable load resistor to dissipate maximum power across the load.