



B.E DEGREE EXAMINATIONS: JUNE 2015

(Regulation 2009)

Second Semester

ECE101: CIRCUIT THEORY

(Common to ECE / EIE)

Time: Three Hours

Maximum Marks: 100

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

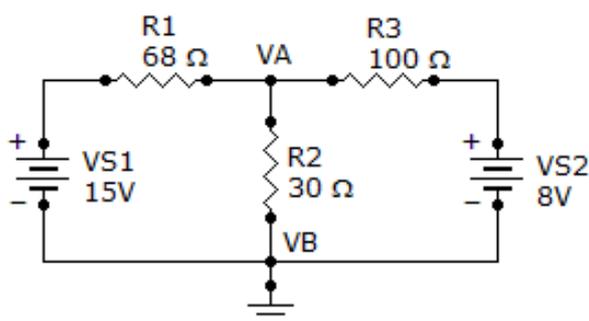
1. A circuit contains two un-equal resistances in parallel
 - a) current is same in both
 - b) large current flows in larger resistor
 - c) potential difference across each is same
 - d) smaller resistance has smaller conductance.
2. We have three resistances of values $2\ \Omega$, $3\ \Omega$ and $6\ \Omega$. Which of the following combination will give an effective resistance of $4\ \Omega$?
 - a) All the three resistances in parallel
 - b) $3\ \Omega$ resistance in series with parallel combination of $2\ \Omega$ and $6\ \Omega$ resistance
 - c) $2\ \Omega$ resistance in series with parallel combination of $3\ \Omega$ and $6\ \Omega$ resistance
 - d) $6\ \Omega$ resistance in series with parallel combination of $2\ \Omega$ and $3\ \Omega$ resistance.
3. A $120\ \text{V}$ voltage source has a source resistance, R_S , of $60\ \Omega$. The equivalent current source is
 - a) $2\ \text{A}$
 - b) $4\ \text{A}$
 - c) $200\ \text{mA}$
 - d) $400\ \text{mA}$
4. A $12\ \text{V}$ source has an internal resistance of $90\ \Omega$. If a load resistance of $20\ \Omega$ is connected to the voltage source, the load power, P_L , is
 - a) $2.38\ \text{W}$
 - b) $2.38\ \text{mW}$
 - c) $23.8\ \text{mW}$
 - d) $238\ \text{mW}$
5. What is the effective value of the periodic voltage $6\cos(25t)$
 - a) $4.24\ \text{V}$
 - b) $36\ \text{V}$
 - c) 8.48
 - d) $3\ \text{V}$
6. In pure inductive circuit, relation between voltage and current are
 - a) Current leads voltage by 90°
 - b) Current lags voltage by 90°

- c) Current and voltage in phase d) Current lags voltage by 25°
7. What is the total reactance of a series RLC circuit at resonance
- a) 0 b) R
c) X_L d) X_C
8. The time constant of RL circuit is
- a) L/R b) R/L
c) RL d) R^2L
9. The case for which the coefficient of coupling is perfectly coupled
- a) $K=0.5$ b) $K=0$
c) $K=0.8$ d) $K=1$
10. The tie set schedule gives the relation between
- a) branch currents and Link voltages b) branch currents and link currents.
c) loop voltages and link voltages d) all of the above

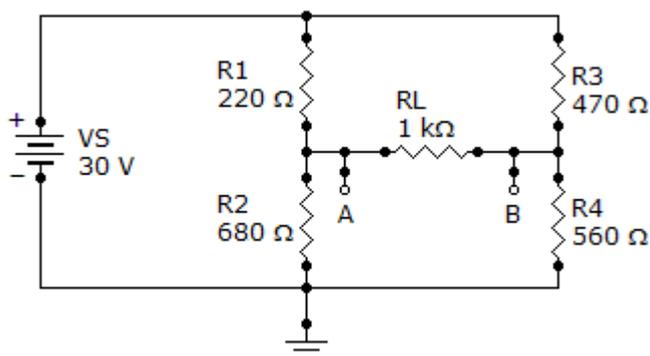
PART B (10 x 2 = 20 Marks)

(Not more than 40 words)

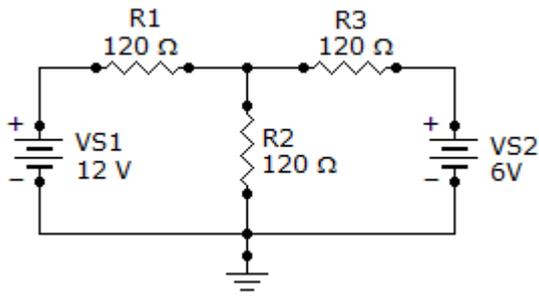
11. State Kirchoff's laws.
12. Find the node voltage V_A .



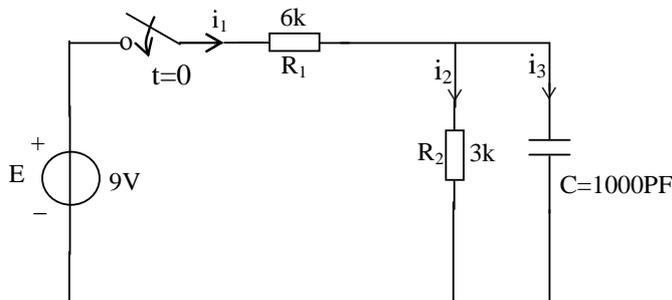
13. What is the Thevenin equivalent voltage and resistance at terminals A and B ?



14. Find the current in R_2 of the given circuit, using the superposition theorem.



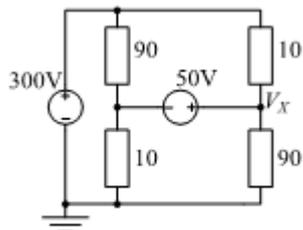
15. A $470\ \Omega$ resistor and a $0.2\ \mu\text{F}$ capacitor are in parallel across a $2.5\ \text{kHz}$ ac source. Find the admittance, \mathbf{Y} , in rectangular form.
16. A $1.5\ \text{k}\Omega$ resistor and a coil with a $2.2\ \text{k}\Omega$ inductive reactance are in series across an $18\ \text{V}$ ac source. Find the power factor.
17. A RL series circuit has the following values: $V = 75\ \text{V}$ dc, $R = 50\ \text{ohms}$, and $L = 15\ \text{H}$.
(a) Find the time constant. (b) How long after the circuit is energized will the current reach a steady value?
18. $v_C(0) = 0$, Find $v_C(t)$ for $t \geq 0$.



19. How many primary volts must be applied to a transformer with a turns ratio of 0.1 to obtain a secondary voltage of $9\ \text{V}$?
20. Define: i) tree ii) co-tree iii) link iv) loop

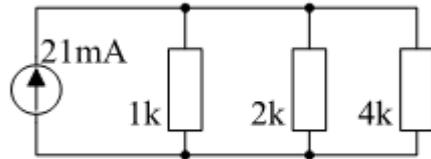
PART C (5 x 14 = 70 Marks)

21. a) Using nodal analysis find V_x in the circuit.

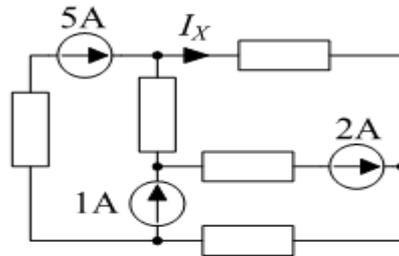


(OR)

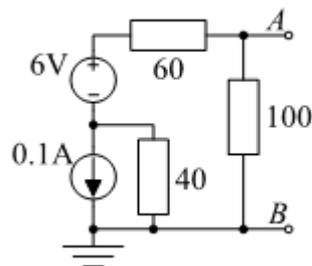
- b) i) Determine the current through each of the resistors in the following circuit and the power dissipated in each of them. Calculate the power supplied by the current source. (10)



- ii) Determine current I_x in the following circuit. (4)



22. a) Find the Thevenin and Norton equivalent circuit at terminals 'A' and 'B'.



(OR)

- b) i) Find the current I in Fig. 1 and for what value of R in Fig. 2 will the power dissipation in R be maximized. Find the power dissipation in R in this case.

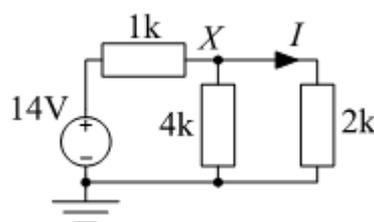


Fig.1

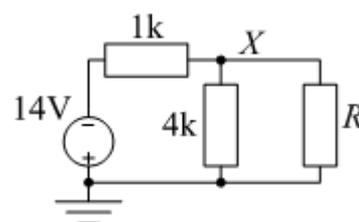
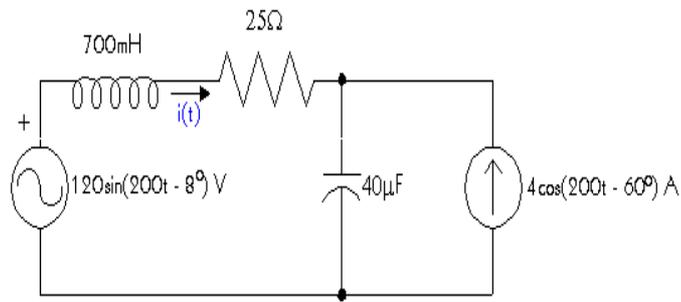


Fig.2

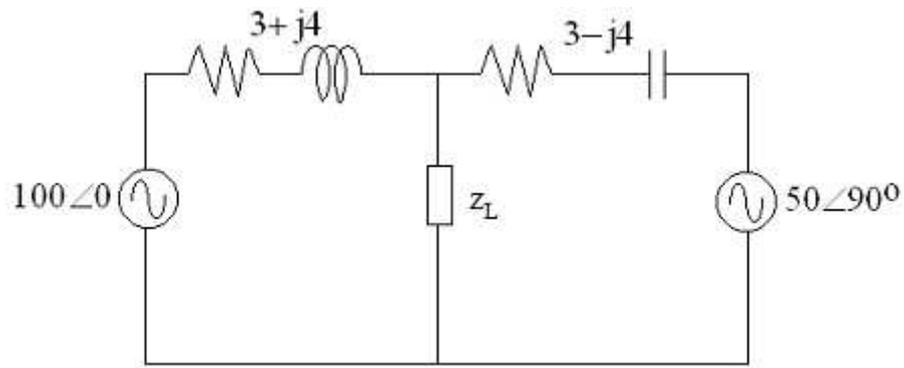
23. a) Find $i(t)$. Represent $i(t)$ in phasor form. Find the power observed or dissipated in

each component.

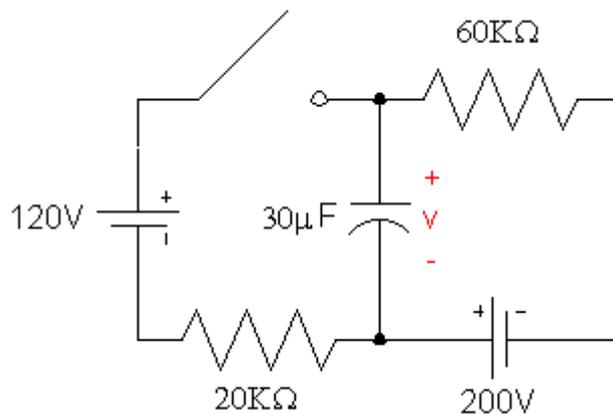


(OR)

- b) In the network shown below, determine the value of impedance Z_L for maximum power and calculate the maximum power.



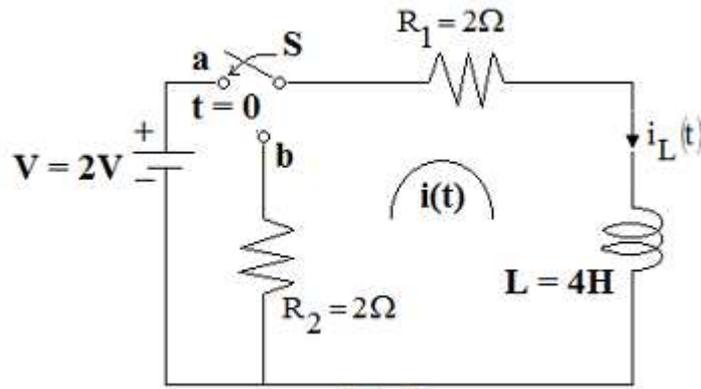
24. a) The switch has been open for a long time, then the switch is closed at $t = 0$. Find V at all times.



(OR)

- b) After steady-state current is established in the R-L circuit shown in Fig.5 with Switch S in position 'a' the switch is moved to position 'b' at $t = 0$. Find $i_L(0^+)$

and $i(t)$ for $t > 0$. What will be the value of $i(t)$ when $t = 4$ seconds?



25. a) Compare construction and characteristics of Linear Transformer and Ideal Transformer .

(OR)

- b) Illustrate with an example loop analysis using graph theory.
