

324354(25)

B. E. (Third Semester) Examination,  
April-May 2016

(New Scheme)

(Elect. Engg. Branch)

ELECTRIC CIRCUITS

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : Attempt all questions. Part (a) of each question is compulsory and carries 2 marks. Attempt any two parts from (b), (c) and (d) and each carries 7 marks.

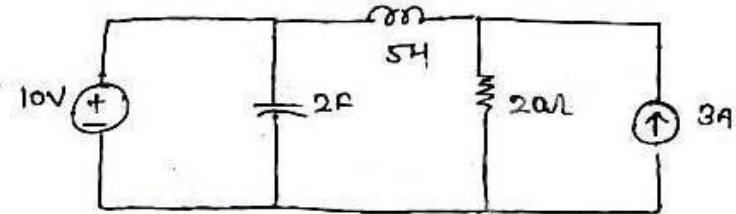
- (a) If a network contains  $B$  branches and  $N$  nodes, then what is the number of mesh current equations? 2

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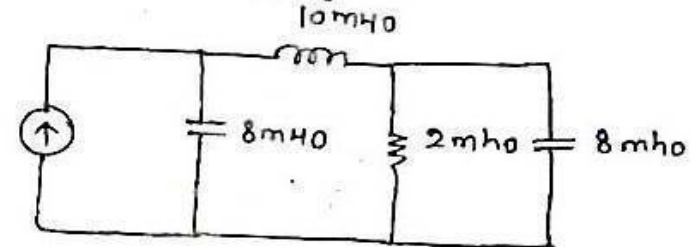
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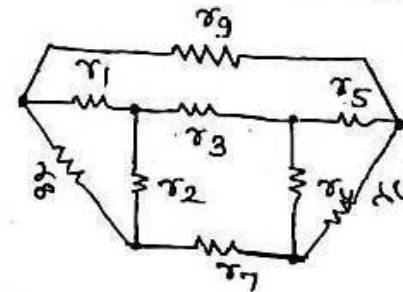
- (b) Obtain the dual circuit for the given figure : 7



- (c) Develop the fundamental cut-set matrix of the network shown in fig. 7

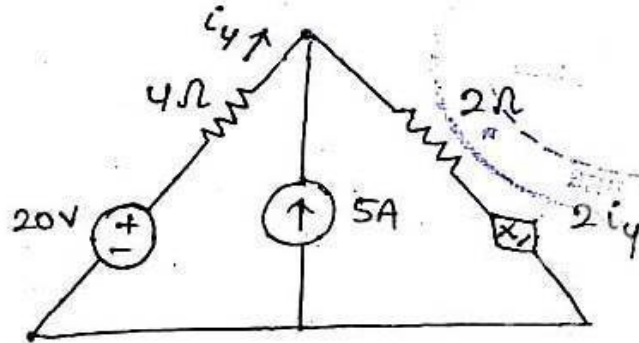


- (d) Represent a resistive network. Draw graph. Select a suitable tree and obtain the tie-set matrix. Write down the KVL equations from the tie-set matrix. 7

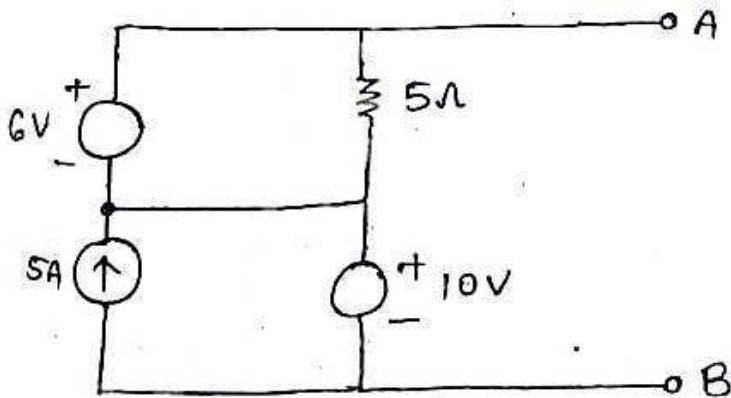


2. (a) What is the condition of maximum power transfer theorem for complex circuit? 2

- (b) For the circuit shown in figure, find the current  $i_4$  using the superposition principle.



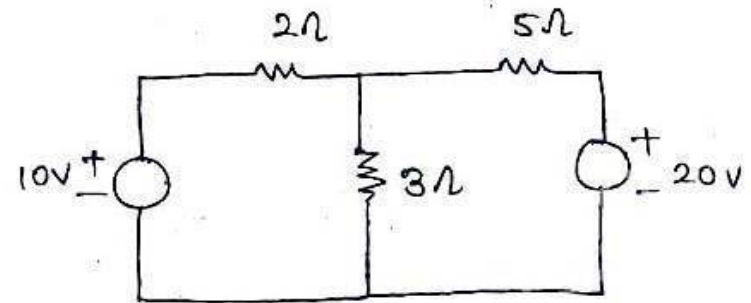
- (c) Determine the voltage across the terminals  $AB$  in the circuit shown in fig.



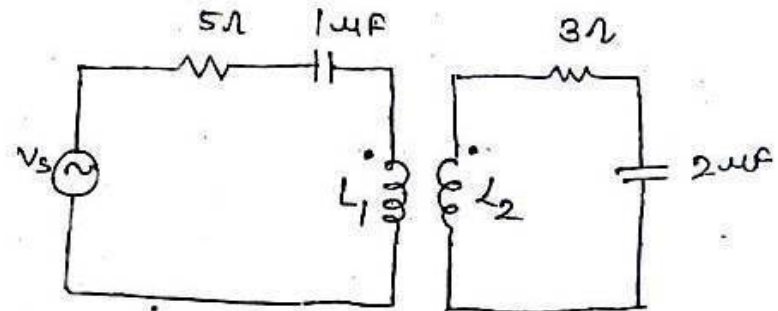
- (d) Calculate the current  $I$  shown in fig. using Millman's theorem.

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3. (a) In a series  $RLC$  circuit, if  $C$  is increased, what happens to the resonant frequency?
- (b) The resonant frequency of the tuned circuit shown in fig. is  $1000 \text{ rad/sec}$ . Calculate the self inductances of the two coils and the optimum value of the mutual inductance.

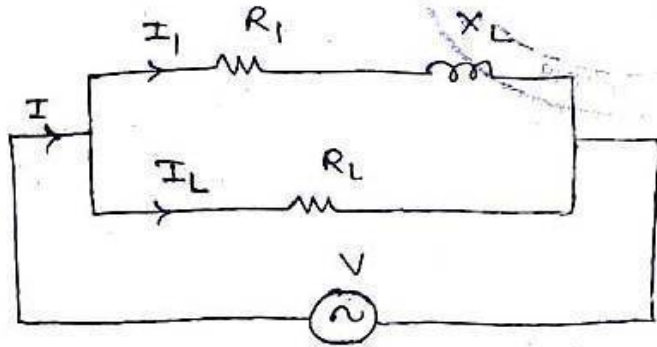


- (c) For the parallel circuit shown in fig. draw the locus of  $I_1$  and  $I$ . Mark the range of values for  $R_1$  between  $10 \Omega$  and  $100 \Omega$ . Assume  $X_L = 25 \Omega$  and

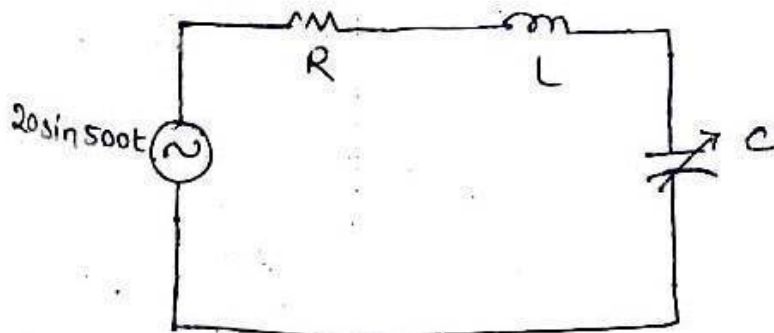
2c

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$R_2 = 25 \Omega$ . The supply voltage is 200 V and frequency is 50 Hz, both held constant.



(d) In the circuit shown in fig., the current is at its maximum value with capacitor value  $C = 20 \mu\text{F}$  and 0.707 times its maximum value with  $C = 30 \mu\text{F}$ . Find the value of  $Q$  at  $\omega = 500 \text{ rad/sec}$  and circuit constants.

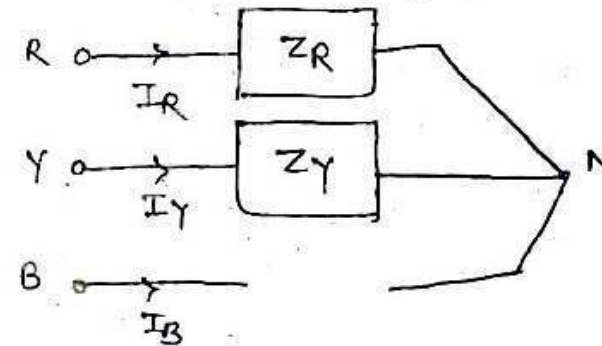


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4. (a) What is the current in the neutral wire in a three-phase unbalanced, four-wire star-connected system. 2
- (b) Calculate the total power input and readings of the two wattmeters connected to measure power in a three-phase balanced load, if the reactive power input is 15 kVAR and the load p.f. is 0.8. 7
- (c) Find  $I_B$  in the three phase circuit of fig. Assume  $Z_R = 5 \angle 30^\circ$  and  $Z_Y = 2 \angle 60^\circ$ , the applied line voltage is 100 V. Assuming the supply to be 50 Hz, write the expressions for  $i_R, i_Y, i_B$ . 7



- (d) Three identical resistances are connected in a star fashion against a balanced three phase voltage supply. If one of the resistors be removed, by how much the power be reduced? 7

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- (a) If  $f(t) = 10 + 8\cos t + 4\cos 3t + 2\cos 5t + \dots$ ,  
What is the angular frequency of the 6<sup>th</sup> harmonic? 2
- (b) Write short note on harmonic resonance in single phase circuit. 7
- (c) Derive the expression of Fourier coefficient of exponential form of Fourier series. 7
- (d) Find the Fourier series expansion of  $f(t)$  given in fig. 7

