Reg. No. :

Question Paper Code : X 20477

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2020

Second Semester

Electronics and Communication Engineering

EE 6201 – CIRCUIT THEORY

(Common to Electrical and Electronics Engineering, Electronics and Instrumentation Engineering, Instrumentation and Control Engineering, Biomedical Engineering and Medical Electronics Engineering)

(Regulations 2013)

Time : Three Hours Maximum : 100 Marks

Answer ALL questions

PART – A **(10×2=20 Marks)**

1. State Ohm's Law.

2. Obtain the current in each branch of the network shown below using Kirchhoff's Current Law.

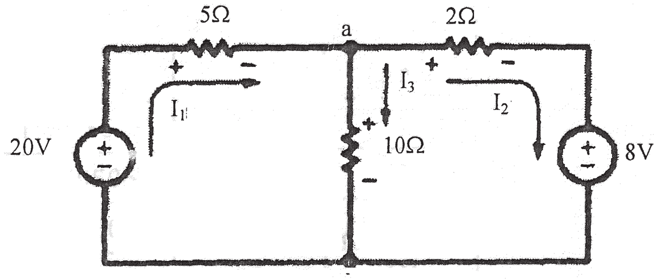

Fig. 1

3. List the applications of Thevenin's theorem.

4. Two resistors of 4Ω and 6Ω are connected in parallel. If the total current is 30 A. Find the current through each resistor shown in Fig. 2.

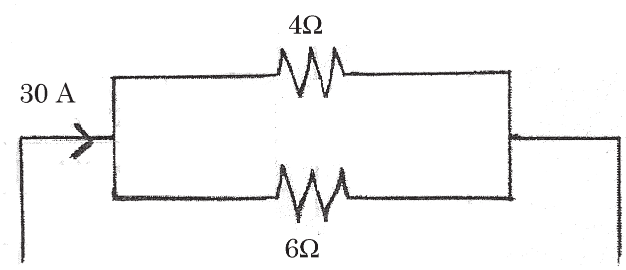

Fig. 2

5. Draw the frequency response characteristics of parallel resonant circuit.

6. Determine the equivalent inductance of the circuit comprising two inductors in series opposing mode.

7. In a series RLC circuit, L = 2 H and C = 5μF. Determine the value of R to give critical damping.

8. Define time constant of RL circuit.

9. Draw the phasor diagram of line currents and line voltages of a balanced delta connected load.

10. Distinguish between unbalanced supply and unbalanced load.

PART – B **(5×16=80 Marks)**

11. a) i) Calculate the node voltages of given circuit in fig. 11. a) i). **(8)**

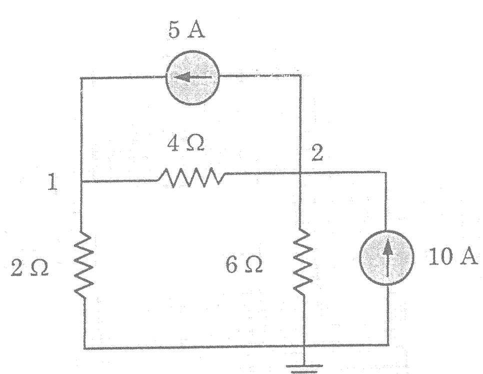

Fig. 11. a) i)

ii) Determine current I_0 for the given circuit in Fig. 11. a) ii) when v_s = 12 V. **(8)**

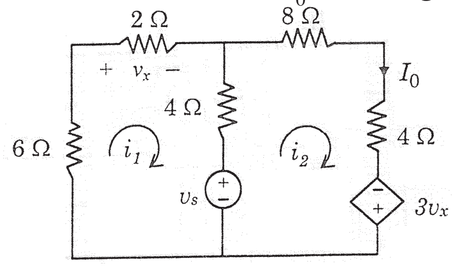

Fig. 11. a) ii)

(OR)

b) i) Using mesh analysis for the given fig. 11. b) i), find the current I_2 and drop across 1Ω resistor. **(12)**

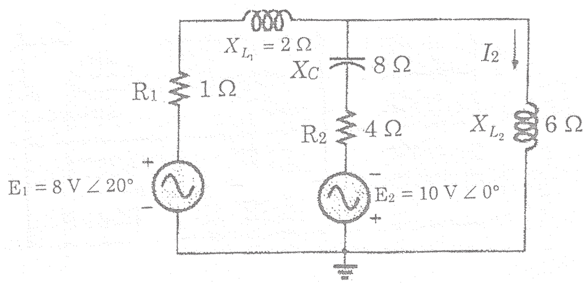

Fig. 11. b) i)

ii) Find the equivalent capacitance C between terminals A and B of fig. 11. b) ii). **(4)**

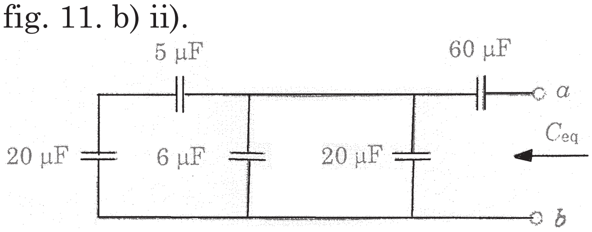

Fig. 11. b) ii)

12. a) i) Compute the current in the 23Ω resistor of the following figure shown below by applying the superposition principle. **(8)**

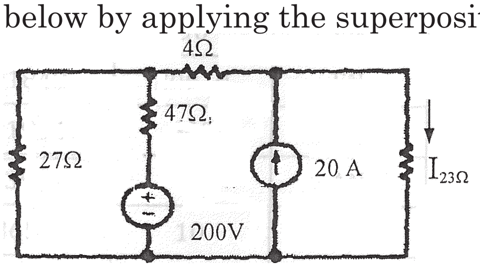

Fig. 12. a) i)

ii) Derive the equation for transient response of RC and RL circuit for DC input. **(8)**

(OR)

b) Obtain the Thevenin and Norton equivalent circuits for the active network shown below. **(16)**

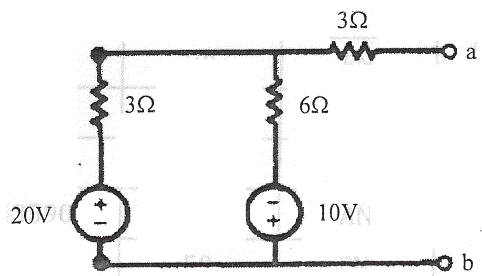

Fig. 12. b)

13. a) i) Derive the expression for resonant frequency and bandwidth for a series RLC resonant circuit. **(8)**

ii) In the parallel RLC circuit of Fig. 13. a) ii), let R = 8kΩ, L = 0.2 mH and C = 8μF. Calculate ω_0, Q, half power frequencies and BW. **(8)**

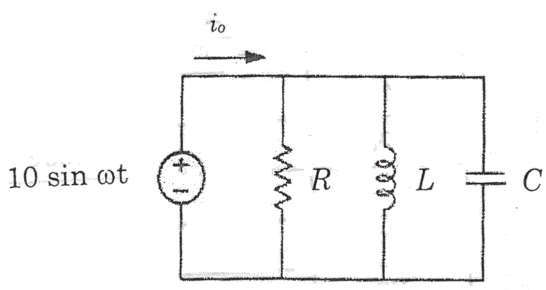

Fig. 13. a) ii)

(OR)

b) i) Find the voltage drop across 12Ω resistor for the given circuit in Fig. 13. b) i). Also, draw the conductively coupled equivalent circuit. **(8)**

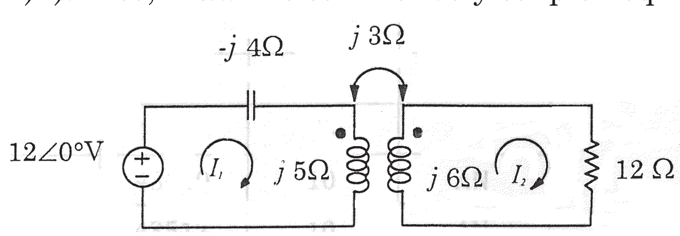

Fig. 13. b) i)

ii) The number of turns in two Coupled coils are 500 turns and 1500 turns respectively. When 5 A current flows in coil, the total flux in this coil is 0.6×10^{-3} wb and the flux linking in second coil is 0.3×10^{-3} wb. Determine L_1, L_2M and K. **(8)**

14. a) A sinusoidal voltage of 10 sin 100 is connected in series with a switch and R = 10 Ω and L = 0.1 H. If the switch is closed at t = 0, determine the transient current i(t). **(16)**

(OR)

b) In the circuit shown in Fig. 14. b). Determine the transient current after switch is closed at time t = 0, given that an initial charge of 100μC is stored in the capacitor. Derive the necessary equations. **(16)**

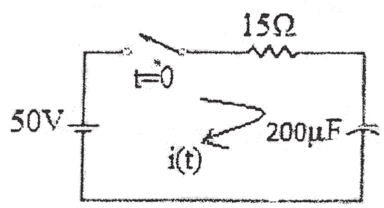

Fig. 14. b)

15. a) Show that three phase power can be measured by two wattmeters. Draw the phasor diagrams. Derive an expression for power factor interms of wattmeter readings. **(16)**

(OR)

b) i) Three equal impedances, each of 8 + j10Ω are connected in star. This is further connected to a 440 V, 50 Hz, three phase supply. Calculate the active and reactive power and line and phase currents. **(8)**

ii) Two wattmeter connected to measure the input to a balanced, three phase circuit indicate 2000 W and 500 W respectively. Find the power factor of the circuit.

1) When both readings are positive and
2) When the later is obtained after reversing the connections to the current coil of one instrument. **(8)**

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