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

Question Paper Code : 60496

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016.

Second Semester

Electrical and Electronics Engineering

EE 2151/EE 25/EE 1151/080280005/10133 EE 205 — CIRCUIT THEORY

(Common to Electronics and Instrumentation Engineering/Instrumentation and Control Engineering)

(Regulations 2008/2010)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. State Ohm's law.

2. State Kirchoff's laws.

3. Convert the following Δ-network shown in Fig. 3 into equivalent Y-network.

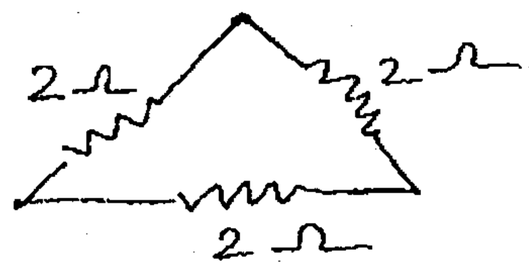


Fig. 3

4. State maximum power transfer theorem in ac circuit.

5. Write the significance of quality factor.

6. Write the empirical formula for coefficient of coupling in coils.

7. Find the time constant of RL circuit having $R = 10\ \Omega$ and $L = 0.1$ mH.

8. A RLC series circuit has $R = 10\ \Omega$, $L = 2$ H. What value of capacitance will make the circuit critically damped?

9. What are the advantages of three phase system?

10. Define line voltage and line current.

PART B — (5 × 16 = 80 marks)

11. (a) In the circuits of Fig. 11 (a), find the current I by the mesh method. (16)

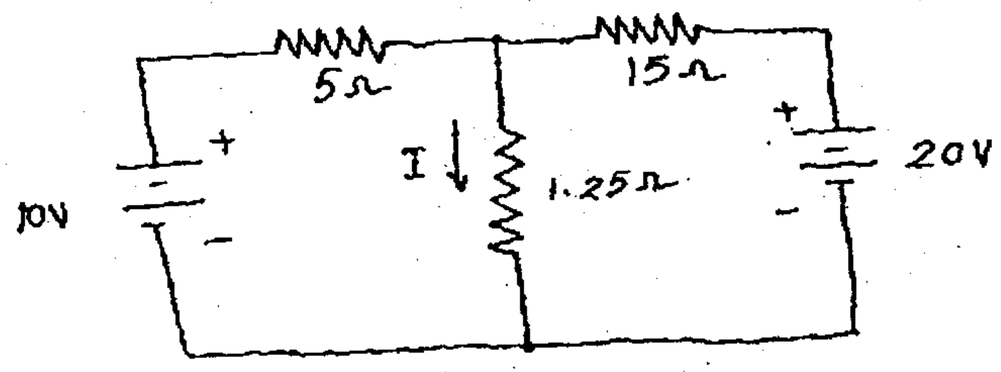


Fig. 11 (a)

Or

(b) Write the nodal equations for the network of Fig. 11 (b). Hence find the potential difference between nodes 2 and 4. (16)

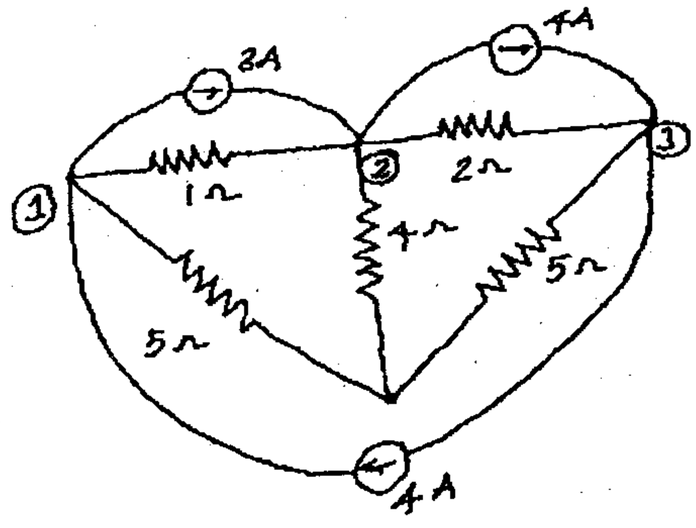


Fig. 11 (b)

12. (a) Obtain the star connected equivalent for the delta connected circuit shown in Figure 12 (a). (16)

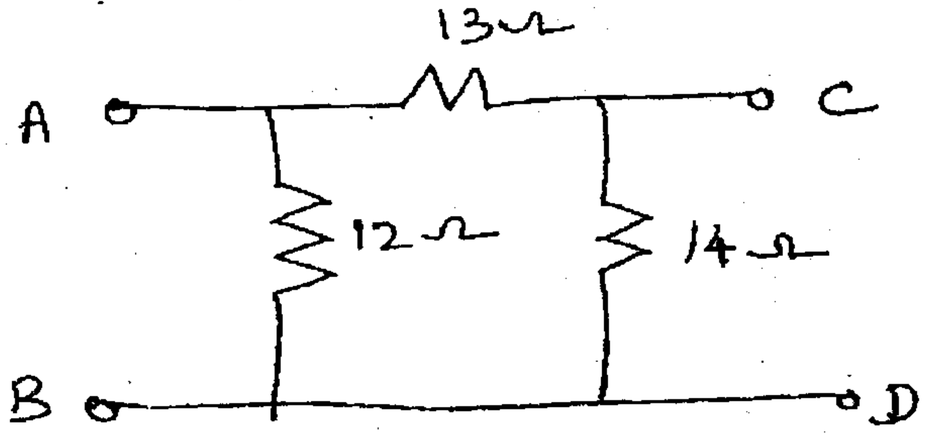
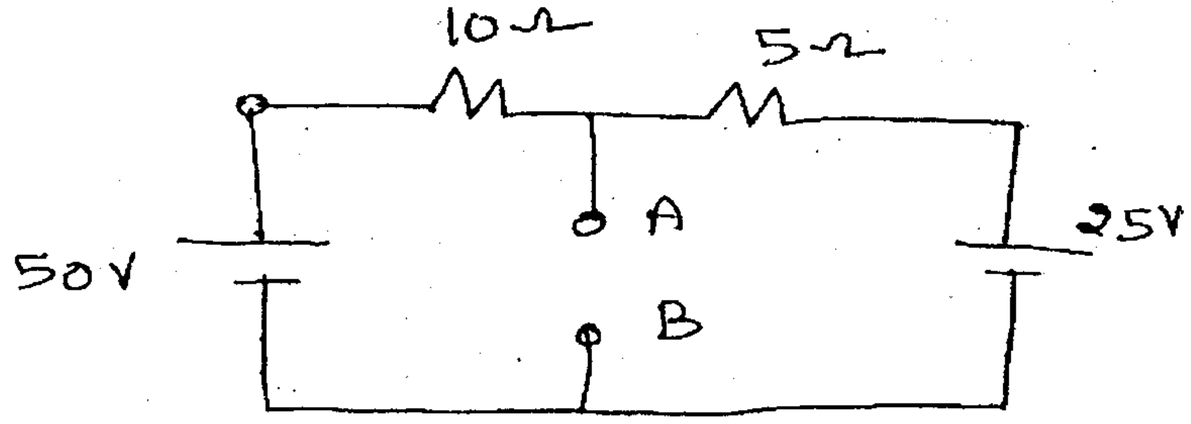


Fig. 12 (a)

Or

(b) (i) State Thevenin's theorem. (6)

(ii) Determine the Thevenin's equivalent circuit across *AB* for the given circuit shown in figure. (10)



13. (a) (i) Derive the resonance frequency 'f_r' for the circuit shown in Fig. 13 (a) (i). (8)

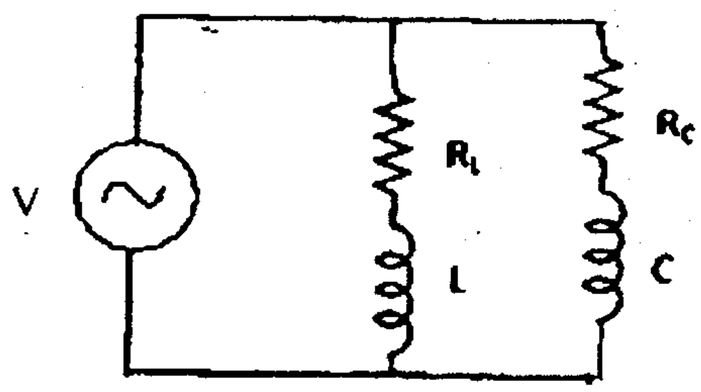


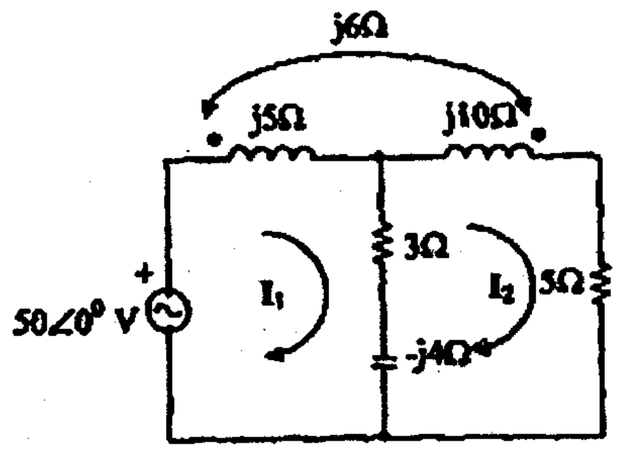
Fig. 13 (a) (i)

(ii) A series circuit with $R = 10\ \Omega$, $L = 0.1$ H and $C = 50\ \mu$F has an applied voltage $V = 50\angle 0^\circ$ V with a variable frequency. Find (1) the resonant frequency, (2) the value of frequency at which maximum voltage occurs across inductor (3) the value of frequency at which maximum voltage occurs across capacitor (4) the quality factor of the coil. (8)

Or

(b) (i) Derive the expression for coefficient of coupling in terms of mutual and self inductances of the coils. (8)

(ii) Obtain a conductively coupled equivalent circuit for the magnetically coupled circuit shown below. (8)



14. (a) (i) In the circuit shown in Fig. 14 (a) (i), find the expression for $i(t)$, $v_R(t)$ and $v_L(t)$ if the switch is closed at $t = 0$. (8)

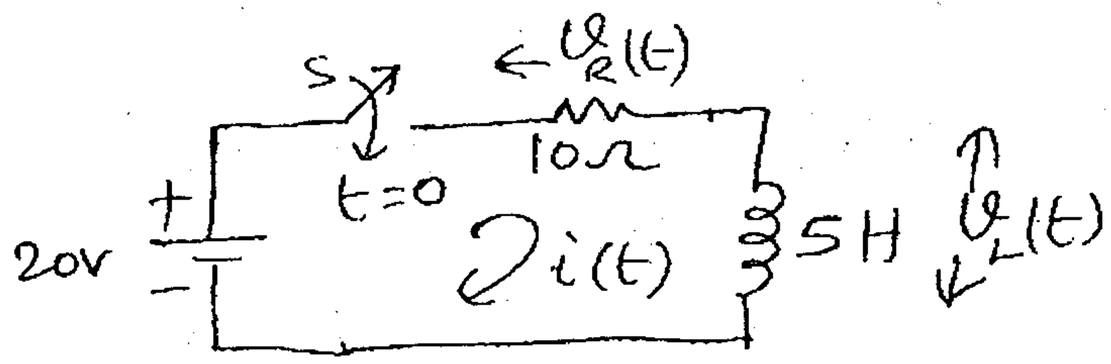


Fig. 14 (a) (i)

(ii) In the circuit shown in Fig. 14 (a) (ii), find the value of current 'i' at $t = 50\ \mu S$ if the switch is closed at $t = 0$ and $v_C(t = 0) = 0$. (8)

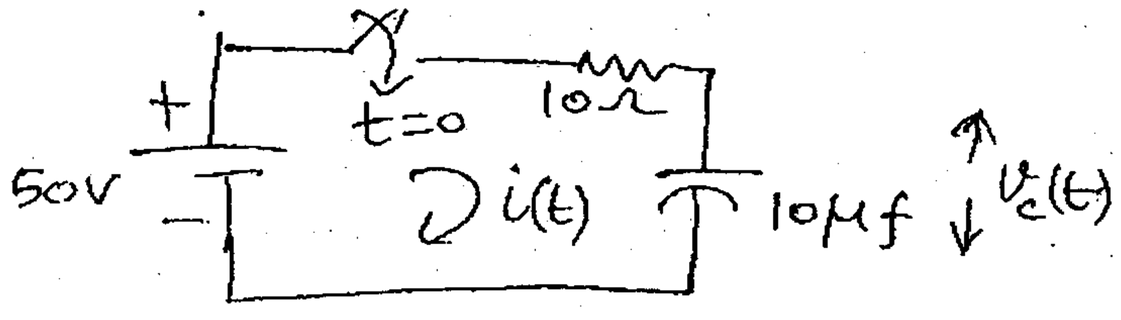


Fig. 14 (a) (ii)

Or

(b) In the circuit shown in Fig. 14 (b), the applied voltage is $150 \sin(314t + \phi)$ volts. If the switch is closed when $\phi = 40°$, determine the expression for $i(t)$. (16)

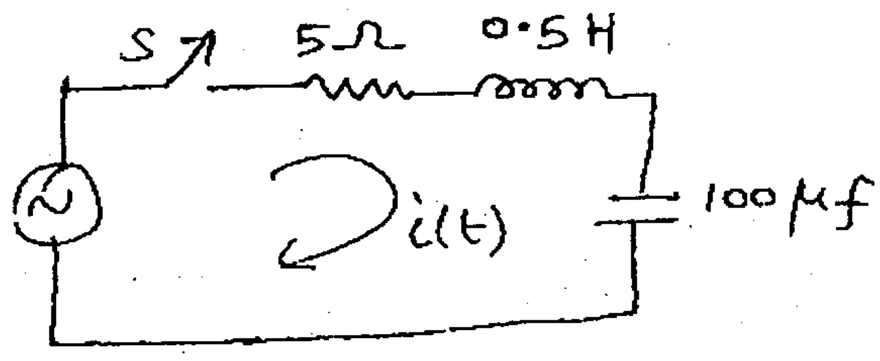


Fig. 14 (b)

15. (a) Define power, power factor. Explain the two Wattmeter method of measuring power in 3-phase circuits with neat sketch.

Or

(b) Derive the current, voltage and power equation for the star connection system and delta connection system.