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

Question Paper Code : 40990

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2018

Second Semester

Electrical and Electronics Engineering

EE6201 – CIRCUIT THEORY

(Common to Biomedical Engineering/Electronics and Communication Engineering/Electronics and Instrumentation Engineering/Instrumentation and Control Engineering/Medical Electronics)

(Regulations 2013)

Time : Three Hours | Maximum : 100 Marks

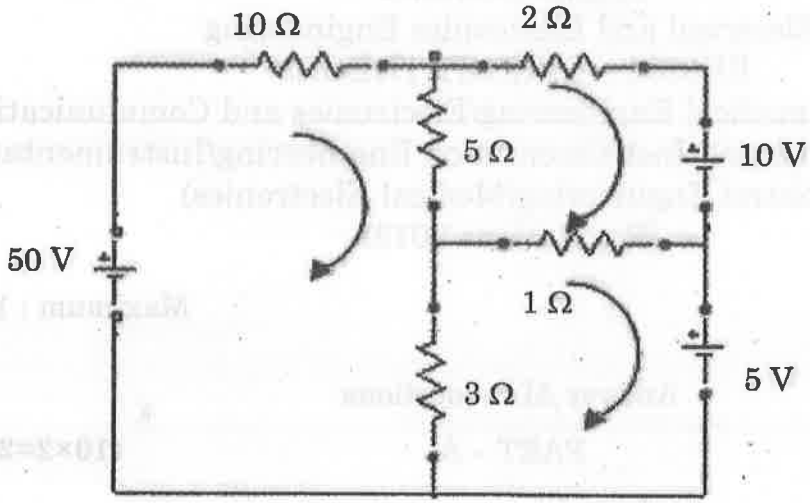
Answer ALL questions

PART – A **(10×2=20 Marks)**

1. Define charge and electric current.
2. A stove element draws 15 A when connected to a 120 V line. How long does it take to consume 30 KJ ?
3. What do you mean by mesh and super mesh ?
4. Write the condition to transfer maximum power from source to load in any AC circuit.
5. Write Dot convention rule.
6. Two coils connected in series have an equivalent inductance of 0.4 H when connected in series aiding and an equivalent inductance of 0.2 H when connected in series opposition. Calculate the mutual inductance of the coils.
7. Define damping ratio. Give the damping ratio expressions for RLC series circuit.
8. Define electrical time constant for RL circuit.
9. Define Apparent power and Power factor.
10. A star connected load has (6 + j8) Ohm impedance per phase. Determine the line current if it is connected to 400 V, three phase and 50 Hz supply.

PART – B (5×13=65 Marks)

11. a) Using mesh analysis, determine the current through 1 Ohm resistor for the given circuit. (13)



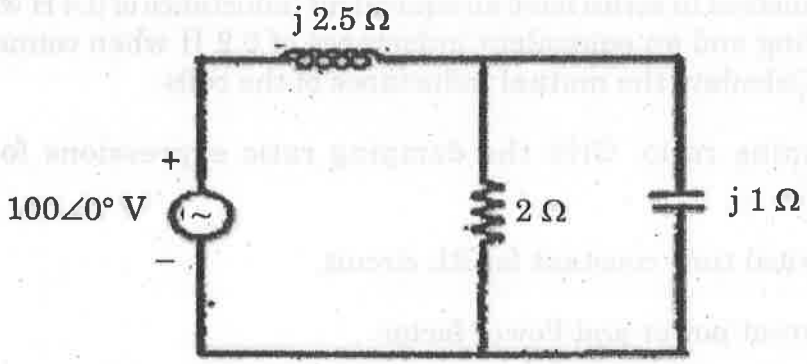
(OR)

b) For the circuit shown below :

a) Determine the currents in all the branches.

b) Calculate the power and power factor of the source.

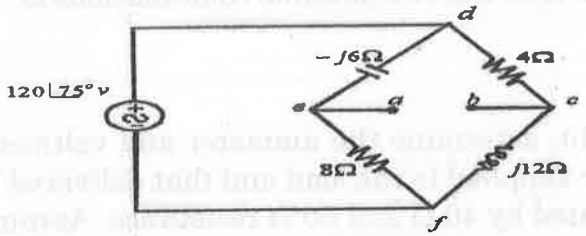
c) Show the power delivered by the source is equal to the power consumed by the 2Ω resistor. (13)



12. a) Derive the expressions to transfer resistance in star connected network into Delta connected network. **(13)**

(OR)

b) Obtain the Thevenin's equivalent circuit at terminals a-b for the figure shown below : **(13)**



13. a) Derive the relation between coefficient of coupling, the self inductance and mutual inductance. **(13)**

(OR)

b) A series RLC circuits consist of R = 1000 Ohm, L = 100 mH & C = 10×10^{-12}F, the applied voltage is 100 V. Calculate :

i) the resonant frequency of the circuit.

ii) the Q-factor of the circuit at resonant frequency.

iii) at what angular velocities do the half power points occur ?

iv) compute the band width of the circuit.

v) the value of frequency at which maximum voltage occurs across inductor

vi) the value of frequency at which maximum voltage occurs across capacitor. **(13)**

14. a) Step by step, derive the transient current for series RLC circuit with step input. **(13)**

(OR)

b) Develop an expression for transient current, voltages and the energy stored in capacitor of a RC transient circuit excited by a DC source. **(13)**

15. a) Show that three phase power can be measured by using two wattmeters. With necessary phasor diagrams, derive an expression for power factor. **(13)**

(OR)

b) An unbalanced four wire star connected load has a balanced supply voltage of 400 V. The load imp are $Z_R = (4 + j8)\ \Omega$, $Z_Y = (3 + j4)\ \Omega$ & $Z_B = (15 + j10)\Omega$. Calculate the line currents, neutral currents and total power ? And also draw the phasor diagram of the same. **(13)**

PART – C (1×15=15 Marks)

16. a) A load impedance when supplied by a source of 100 V takes a current of 7.5 A. The power supplied to the load is measured as 500 W.

a) Determine the power factor of the load.

b) If the supply frequency is 50 Hz, find the two possible combinations of elements forming the load. **(15)**

(OR)

b) For the circuit, shown in Fig. 16 (b), determine the ammeter and voltmeter readings. Also determine the power supplied to the load and that delivered by the source. Calculate power dissipated by 40 Ω and 60 Ω resistance. Assume ammeter and voltmeter impedances as zero and infinity respectively. **(15)**

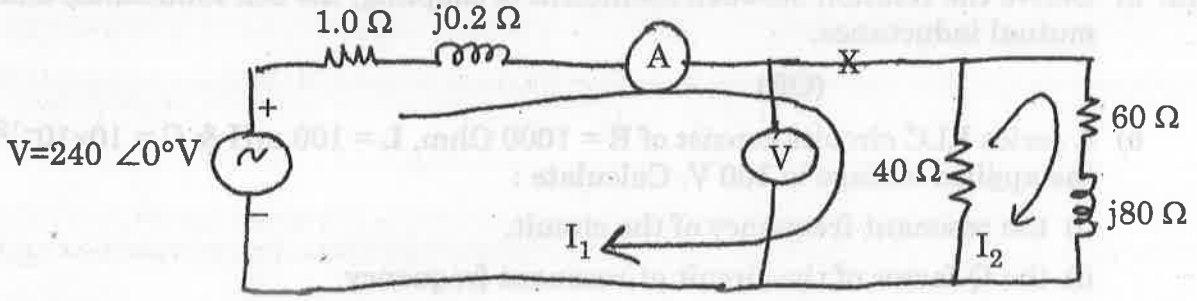


Fig. 16 (b)