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**Question Paper Code: 31054**

B.E. / B.Tech. DEGREE EXAMINATION, OCTOBER 2014.

Third Semester

Electronics and Instrumentation Engineering

01UEI304 - ELECTRICAL CIRCUITS AND NETWORKS

(Common to Instrumentation and Control Engineering)

(Regulation 2013)

Duration: Three hours

Maximum: 100 Marks

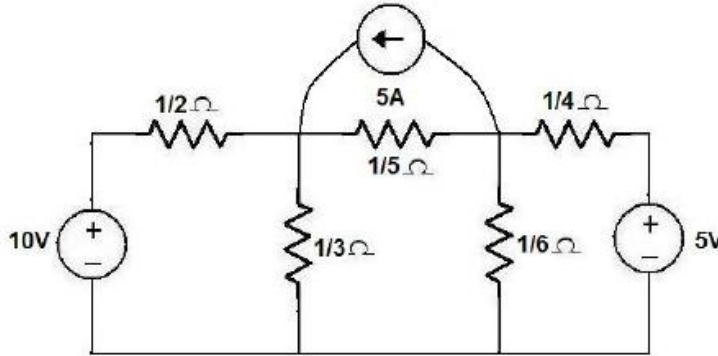
Answer ALL Questions.

PART A - (10 x 2 = 20 Marks)

1. State Ohm's law.
2. Give the advantages of sinusoidal alternating quantity.
3. Find the equivalent voltage source for a current source of 15A when connected in parallel with 5 ohm resistance.
4. State Superposition theorem.
5. Determine the resonance frequency for  $R = 10\Omega$ ,  $L = 0.5mH$ ,  $C = 10\mu F$ .
6. State dot rule for coupled coils.
7. What is transient and why transients occur in electric circuits?
8. Distinguish between free and forced response.
9. How can a Watt meter be used to measure reactive power?
10. A three phase balanced star connected load has 400V line to line voltage and 10A line current. Determine the line to neutral voltage and phase current.

PART - B (5 x 16 = 80 Marks)

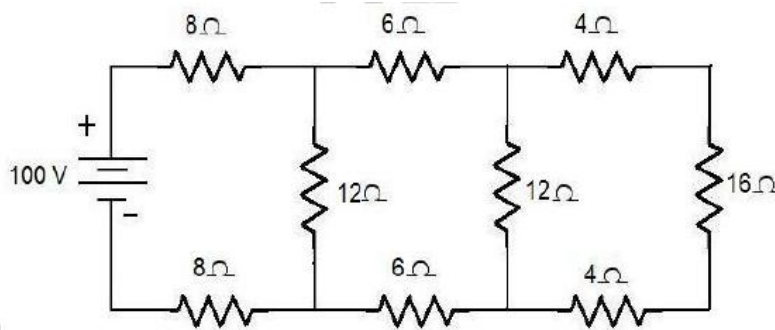
11. (a) (i) Using the node voltage analysis, find all the node voltages and currents in  $1/3 \text{ ohm}$  and  $1/5 \text{ ohm}$  resistances of figure. (10)



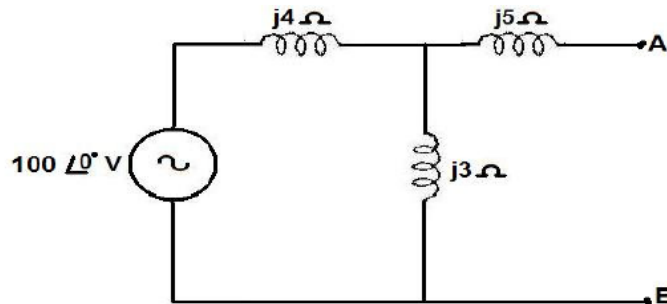
- (ii) Discuss about voltage and current division principles. (6)

Or

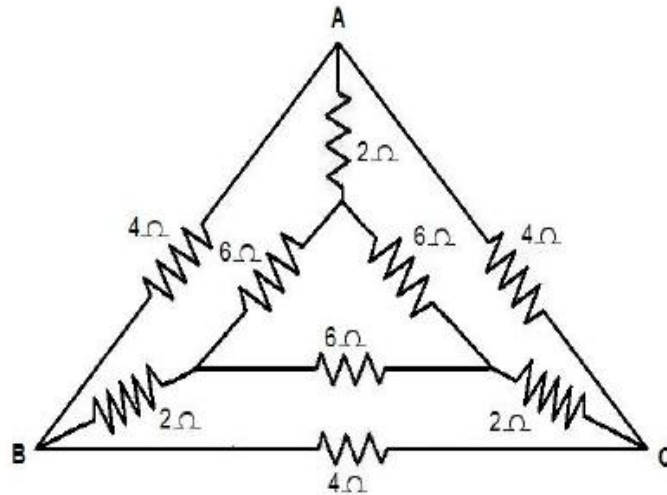
- (b) Calculate (i) the equivalent resistances across the terminals of the supply, (ii) total current supplied by the source and (iii) power delivered to  $16 \text{ ohm}$  resistor in the circuit shown in figure. (16)



12. (a) (i) Determine the Thevenin's equivalent circuit. (8)

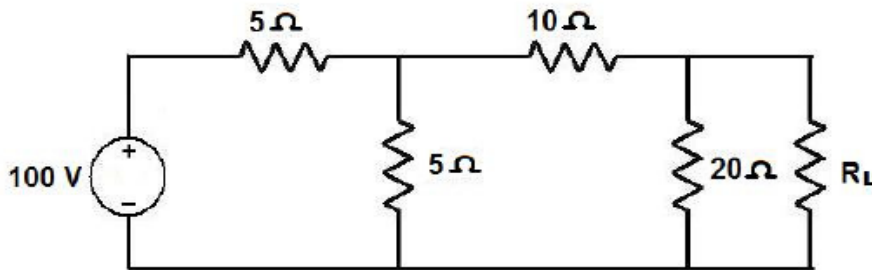


- (ii) Find the equivalent resistance between  $B$  and  $C$  in figure. (8)



Or

- (b) (i) Find the value of  $R_L$  so that maximum power is delivered to the load resistance shown in figure. (8)



- (ii) State and explain reciprocity theorem. (8)

13. (a) A series RLC circuit has the following parameter values:  $R = 10 \text{ ohms}$ ;  $L = 1 \text{ H}$  and  $C = 1 \mu\text{F}$ . (i) Compute the resonant frequency in radians/sec, (ii) Calculate the quality factor of the circuit, (iii) What is the value of the bandwidth?, (iv) Calculate the lower and upper half power frequency points of the bandwidth in radians/sec. (16)

Or

- (b) (i) For the given circuit constants, find (i) Mutual Inductance (ii) Find equivalent inductance for all the combination  $L_1 = 0.02\text{H}$ ,  $L_2 = 0.01\text{H}$  and  $k = 0.5$ . (8)
- (ii) Calculate the mutual inductance of two coils of self - inductances  $100\mu\text{H}$  and  $240\mu\text{H}$ , which are connected in series to yield a total inductance of  $146\mu\text{H}$ . (4)

(iii) Two inductively coupled coils have self-inductance  $L_1 = 50mH$  and  $L_2 = 200mH$ . If the coefficient of coupling is 0.5, calculate the mutual inductance. Also find the maximum possible mutual inductance. (4)

14. (a) A series RLC circuits has  $R = 50\ ohm$ ,  $L = 0.2H$ , and  $C = 50\ \mu F$ . Constant voltage of 100V is impressed upon the circuit at  $t = 0$ . Find the expression for the transient current assuming initially relaxed conditions. (16)

Or

(b) Derive an expression for current response of RL and RC series circuit transients. (16)

15. (a) (i) A balanced three phase star connected load with impedance  $(8+j6)$  ohm per phase is connected across a symmetrical 400V three phase 50Hz supply. Determine the line current, power factor of the load and total power. (8)

(ii) A Voltage source 100V with resistance of 10 ohms and inductance 50 mH, a capacitor  $50\mu F$  are connected in series. Calculate the impedance when the frequency is (i) 50Hz (ii) 500Hz (iii) the power factor at 100Hz. (8)

Or

(b) With a neat circuit and phasor diagram, explain the three phase power measurement by two Wattmeter method and also derive the expression for Power Factor. (16)

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