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

Question Paper Code: 31354

B.E. / B.Tech. DEGREE EXAMINATION, NOVEMBER 2015

Third Semester

Electronics and Instrumentation Engineering

01UEI304 – ELECTRICAL CIRCUITS AND NETWORKS

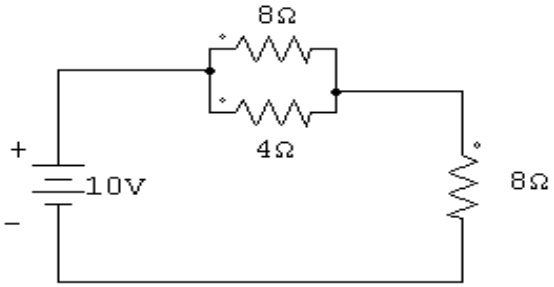
(Regulation 2013)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions.

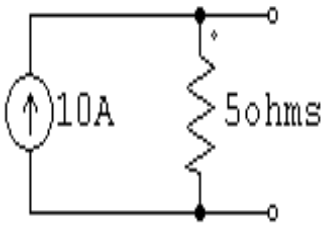
PART A - (10 x 2 = 20 Marks)

1. Calculate the current in 4 Ω resistor.



2. Define Kirchhoff's laws.

3. Convert the given current source into voltage source.



4. Define maximum power transfer theorem.

5. Identify the significance of *Q* factor in resonant circuit.

6. Sketch the frequency response of a single tuned circuit.

7. Distinguish between steady state and transient response of an electric circuit.

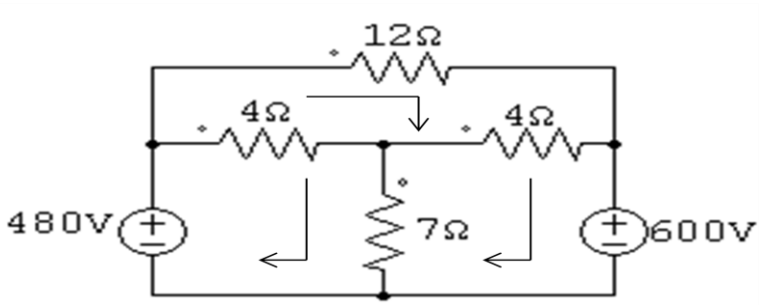
8. Formulate the time constant for series RL and series RC circuits.

9. List the advantages of three phase system.

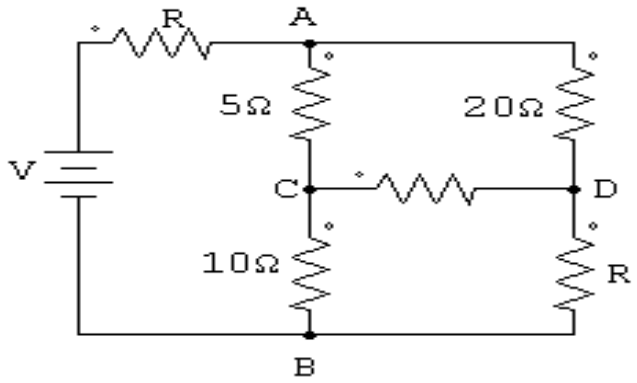
10. The power input to a 3 phase induction motor is 20 *kW* when connected to a 3 phase, 50*Hz*, 440*V* supply taking a current of 30 *A*. Calculate the power factor for the motor.

PART - B (5 x 16 = 80 Marks)

11. (a) (i) Write the mesh equations for the given circuit and calculate the current in the 12*Ω* resistor. (8)



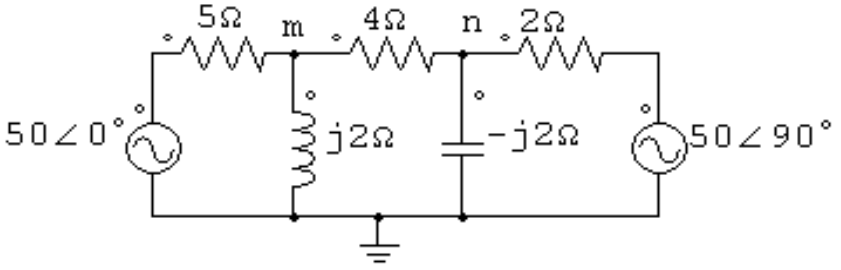
(ii) Determine the value of R in the circuit when the current is zero in the branch CD.



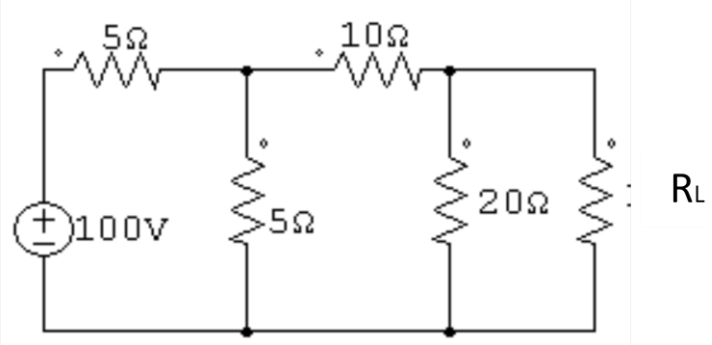
(8)

Or

(b) Using nodal voltage method, calculate the voltages of nodes '*m*' and '*n*' and currents through *j2Ω* and - *j2Ω* reactance in the network. (16)



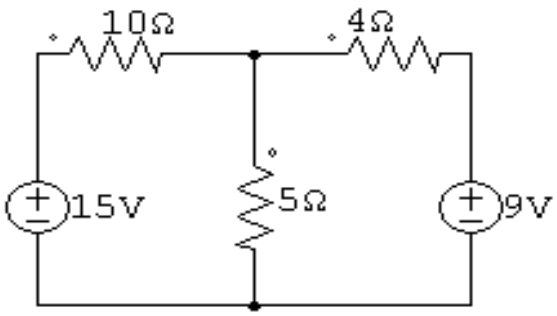
12. (a) Determine the value of RL so that maximum power is delivered to the load resistance R_L.



(16)

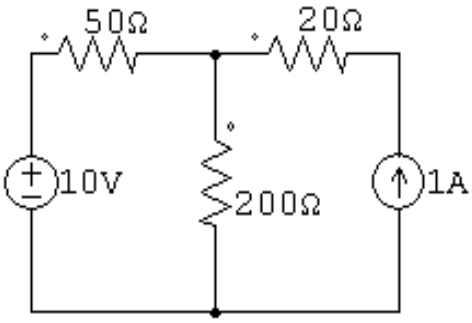
Or

(b) (i) Apply Thevenin's theorem to calculate current through 4Ω resistance for the given circuit.



(8)

(ii) Using Norton's theorem, determine the voltage across 200Ω resistor in the given circuit.



(8)

13. (a) (i) A series *RLC* circuit consists of 50Ω resistance, $0.2H$ inductance and $10\mu F$ capacitance with applied voltage of $20V$. Determine (a) Resonant frequency (b) *Q* factor of the circuit (c) the lower and upper frequency limits and (d) the bandwidth of the circuit. (10)

(ii) Explain the characteristics of RLC series resonant circuit. (6)

Or

(b) (i) Two identical coils with $L = 0.03H$ have a coefficient of coupling of $k = 0.8$. Determine mutual inductance and the equivalent inductance with the coils connected in series opposing mode. (6)

(ii) Briefly explain (a) Mutual inductance (b) Coefficient of coupling. (10)

14. (a) Formulate the expression for step response of RLC series circuit for critical damping condition. (16)

Or

(b) A series RC circuit consists of $R = 10\Omega$ and $C = 0.1\ F$. A constant DC voltage of $20V$ is applied to the circuit at $t = 0$ by closing switch. Find the expression for voltage across capacitor Vc , and current through capacitor i_c also determine the voltage across resistor. (16)

15. (a) (i) Using phasor diagram, formulate the relationship between line current and phase current related to delta connected load. (8)

(ii) A symmetrical 3 phase $400V$ system supplies a balanced delta connected load. The current in each branch circuit is $20A$ and phase angle 40^o (lag). Calculate the line current, power factor and total power of the circuit. (8)

Or

(b) (i) Prove that the sum of wattmeter readings in three phase circuit measures three phase power whether the load is balanced or not. (10)

(ii) Two wattmeters are used to measure power in a 3 phase load. The wattmeter readings are $400W$ and $-35W$. Calculate total active power, power factor and reactive power. (6)

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