



MBZ-1

Seat No. _____

M. Sc. (ECI) (Sem. II) (CBCS) Examination

April / May - 2018

Paper - 5 : Basic Circuit Analysis

Time : $2\frac{1}{2}$ Hours]

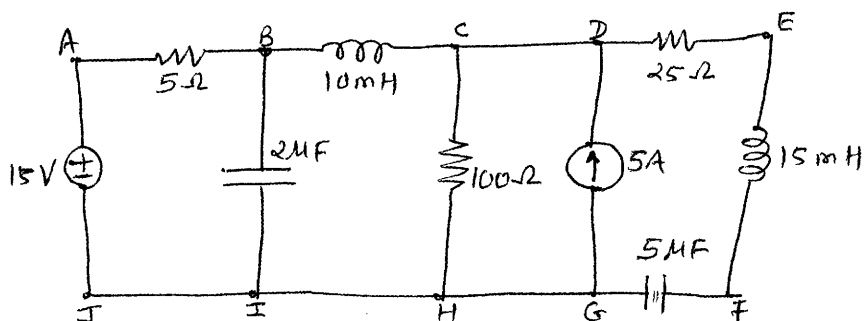
[Total Marks : 70

1 Answer any **seven** from the following : 14

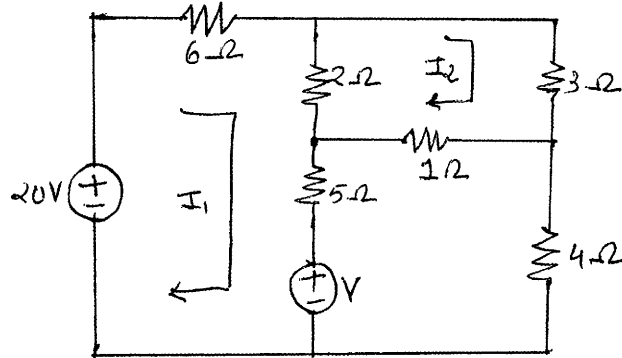
- (1) Define tree, twig, cut-set, and tie-set.
- (2) Derive an Incidence matrix from a graph of your choice.
- (3) Define mesh, node, supermesh, and Supernode.
- (4) State Thevenin's theorem.
- (5) Write the statement of Reciprocity theorem.
- (6) Draw a reference sine wave, a leading sine wave, and a lagging sine Wave with their respective mathematical equations.
- (7) If $Z_1 = 4 + j8$ and $Z_2 = 25 \angle 45^\circ$ find $Z_1 + Z_2$
- (8) Define resonance in RLC circuit. What is bandwidth?
- (9) What is the use of dot convention?
- (10) Prove that $L \propto N^2$

2 Answer any **two** from the following :

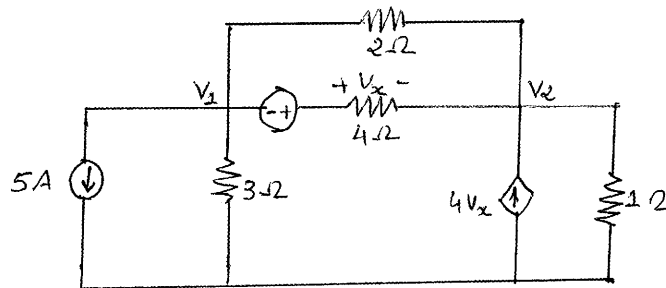
- (A) For the electrical network shown below, draw its graph, write its incidence matrix, tie-set matrix, link current transformation equation and branch current. 7



- (B) Determine the voltage V which causes the current I_1 to be zero for the circuit shown below. Use mesh analysis. 7



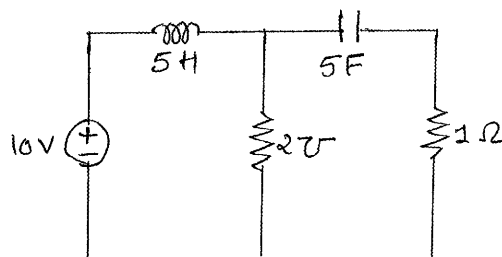
- (C) For the circuit shown below find the voltage across the 4Ω resistor by using nodal analysis. 7



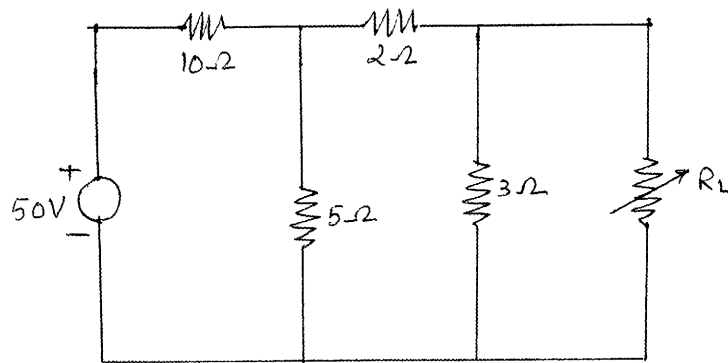
- 3 Answer the following
- (A) If $R_A, R_B,$ and R_C are the resistors connected in star configuration, obtain the conversion formulae for R_1, R_2 and R_3 which are to be connected in delta configuration. 7
- (B) Explain the Norton's theorem with one example. 7

OR

- 3 Answer the following :
- (A) Convert the following circuit in its dual form. 7



- (B) Determine the maximum power delivered to the load in the circuit Shown below. 7



- 4 Answer the following :
- (A) Discuss the impedance of series RL circuit in detail. 7
- (B) Write about the voltage and current response of the series RLC circuit and derive the condition for the maximum voltage across the inductor and capacitor. 7
- (C) Draw an RLC circuit such that R_L and X_L are in series while R_C and X_C also in series but both branches are in parallel to each other and driven by an AC source voltage V . Discuss locus diagram for the following cases : 7
- (1) Variable X_L
 - (2) Variable X_C
 - (3) Variable R_L
 - (4) Variable R_C
- 5 Answer any **two** from the following :
- (A) Write on average, apparent and reactive power. 7
- (B) Discuss parallel connection of coupled circuit with proper mathematical Derivation. 7
- (C) Draw the RL circuit for its DC response. 7
Derive the equations for its total current, voltages of the resistor and inductor along with the power of both of them. Draw the response curves for current, voltage and power.
- (D) Draw a series RL circuit driven by a source $v(t) = V \cos(\omega t + \theta)$ and derive the expression for the total current. 7