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Question Paper Code : 40036

B.E. DEGREE EXAMINATION, APRIL/MAY 2018
Second Semester
Electrical and Electronics Engineering
EE 8251 – CIRCUIT THEORY
(Common to Electronics and Instrumentation Engineering and Instrumentation and Control Engineering
(Regulations 2017)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A (10×2=20 Marks)

1. State Kirchoff's current law.
2. Estimate the resultant resistance produced by the parallel connection of two resistors of 10Ω and 30Ω.
3. Draw the circuit of a practical voltage source and its equivalent current source.
4. Let a network has Thevenin's equivalent circuit with source of $5V_{rms}$ and impedance of 50-j30Ω. Find optimum value of load to derive maximum power from the network.
5. Define time constant and write the time constant of a series RC circuit.
6. Let a RL circuit has 50Ω and 1 mH elements and free of source but, the inductor has initial current of 1 mA at time $t=0^-$s. Find the voltage across the resistor at time $t = \infty$.
7. Draw the phasor diagram of voltages derived from a 3-phase source.
8. In a reactive circuit, the current leads the voltage by angle 45°. Find whether the resultant reactive is either inductive or capacitive and power factor.
9. Comment on the impedance and phase angle between voltage and current at resonance.
10. If circuit resonates at 1 MHz and produces –3dB bandwidth of 100 kHz then, find the quality factor of the circuit.

PART – B **(5×13=65 Marks)**

11. a) Apply mesh analysis to the circuit shown in Fig. Q. 11. a) and find voltage across the dependent source.

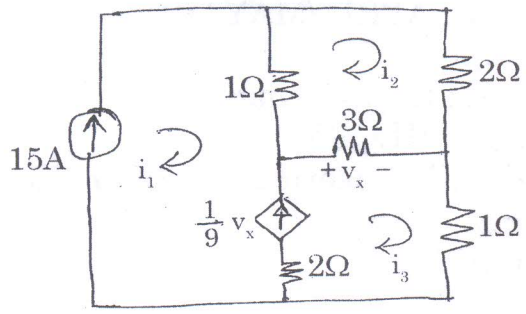

Fig. Q. 11. a)

(OR)

b) Apply nodal analysis to the circuit shown in Fig. Q. 11. b) i) and find :

i) The voltage at each node of the circuit. **(8)**

ii) State and explain Kirchoff's laws. **(8)**

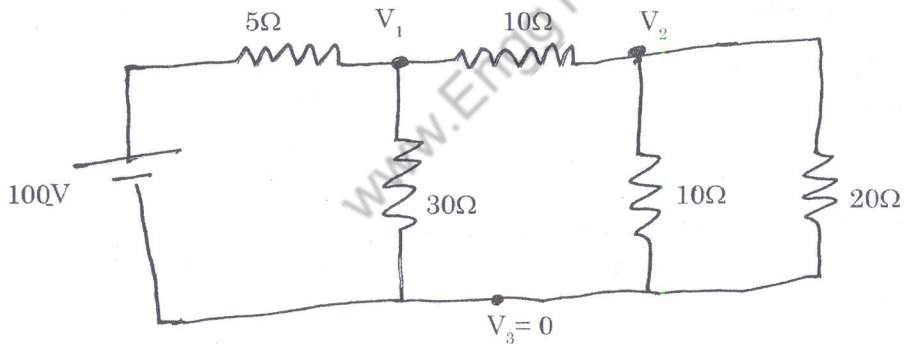

Fig. Q. 11. b) i)

12. a) State superposition theorem and apply to the circuit shown in Fig. 12. a) to find the voltage across –j20Ω capacitor.

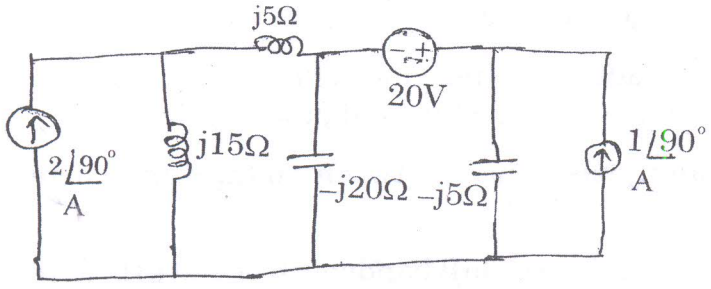

Fig. 12. a)

(OR)

b) Determine Thevenin's and Norton's equivalent circuit of the network shown in Fig. Q. 12. b).

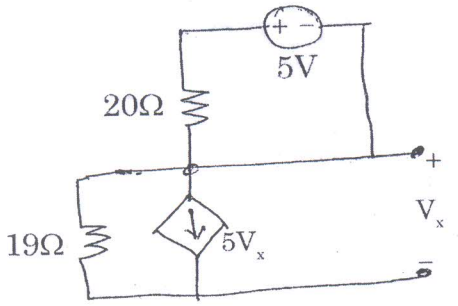

Fig. Q. 12. b).

13. a) Consider a source free parallel RLC circuit and evaluate the voltage response of the circuit on different damping conditions.

(OR)

b) Consider a series RC circuit has been energized by a DC source of V_0 Volts over infinite duration. Suddenly at time t=0s, the DC source potential increased to V_1 Volts. If so, find the voltage across the capacitor for all values of time 't'.

14. a) Discuss the method of measuring power in a three-phase system with balanced and unbalanced load conditions.

(OR)

b) Consider a series RLC circuit is energized by a sinusoidal signal source (assume amplitude of A_m and frequency of ω).

i) What would be the instantaneous and average power delivered by source. **(7)**

ii) What would be the instantaneous and average power dissipated by elements R, L and C. **(6)**

15. a) Consider the circuit shown in Fig. 15. a). Find the voltage across 1Ω resistor at resonance.

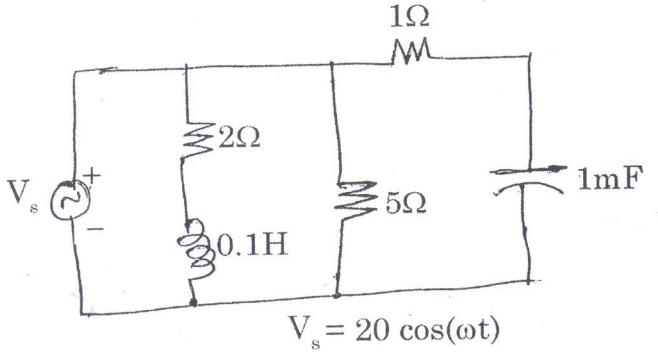

Fig. 15. a)

(OR)

b) Consider the circuit shown in Fig. 15. b). Find the voltage across 3Ω resistor.

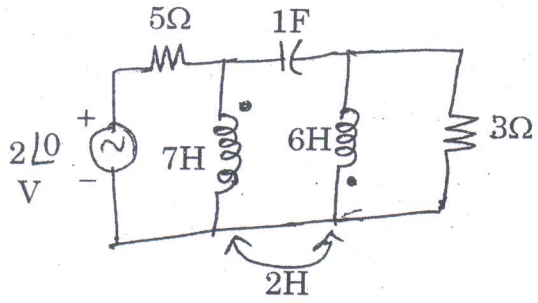

Fig. 15. b)

PART – C **(1×15=15 Marks)**

16. a) Determine Thevenin's and Norton's equivalent circuits for the circuit shown in Fig. 16. a) Also, find the optimum value of Z_L to derive maximum power from the network and the resultant power derived by Z_L.

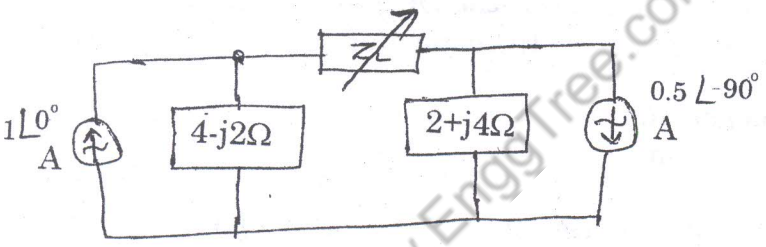

Fig. 16. a)

(OR)

b) For the circuit shown in Fig. 16. b), determine expressions for i_1 and i_2 for $t > 0$, given the initial conditions, $i_1(0) = i_2(0) = 11$ A.

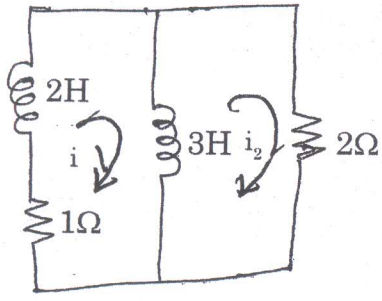

Fig. 16. b)